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THE USE OF VOCABULARY IN THE MEASUREMENT OF INTELLECTUAL DETERIORATION—A REVIEW

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1. INTRODUCTION

THE problem of determining whether or not a particular individual has deteriorated intellectually or with respect to other skills is one which has exercised the ingenuity of clinical psychologists for a long time. Clearly the most satisfactory method from the point of view of reliability and validity is by means of the test-retest method over a given period of time, using tests for which adequate statistical information is available. However, since a direct estimate of the individual's previous level of intelligence is usually not available and since the psychologist often cannot wait six months or longer to obtain a direct retest, some method had to be devised which would overcome this difficulty. Babcock (1930) hit on the method of using the Vocabulary test as an estimate of previous level of intellectual ability and contrasting it with performance on other tests supposedly sensitive to deterioration in order to measure the amount of decline which had taken place.

Some aspects of the use of vocabulary in clinical psychological testing have been reviewed by a number of writers (Cronbach, 1942; Feifel, 1949; Hunt, 1936; Jastak, 1949; Lewinski, 1948; Raven and Walshaw, 1944; Shakow, 1946), and the immense interest shown in vocabulary as a test may be inferred from the 101-page bibliography of vocabulary studies published by Dale (1949). However, previous reviews suffer from two defects in that (a) they do not attempt to cover the ground thoroughly or systematically, being usually introductory to an experiment, or not specifically concerned with the subject matter of this paper; and (b) they naturally give no information about the important research which has taken place in this field within the last few years. The present review has been undertaken for these reasons, and because of the intrinsic importance of the problem.

2. RATIONALE

The argument in favour of making use of vocabulary scores to assist in the determination of whether or not intellectual deterioration has taken place would seem to involve six main steps.

(a) Certain abilities decline as a result of mental illness, e.g. speed, motor ability and co-ordination, learning and retention.

(b) Vocabulary on the other hand is relatively resistant to such decline.

(c) Vocabulary is highly correlated with other estimates of "g" level.

(d) Vocabulary may, therefore, be used as a measure of previous level of intelligence.

(e) Other tests may be used as a measure of present level of functioning.

(f) The discrepancy between past and present level estimates serves as an indication of the amount of decline.

There have been three major attempts to construct tests based on this rationale and a host of minor attempts.

(i) *The Babcock-Levy Revised Examination for the Measurement of Efficiency of Mental Functioning*. This test, which was first reported by Babcock (1930) has passed through several revisions, the most recent revised form being issued in 1940. The *Efficiency Index* (EI) contrasts the level reached on the vocabulary test with the level reached on a number of other measures (easy questions, learning, repetition, motor, initial learning, easy continuous) or with the total score on these tests. In patients who have deteriorated it is hypothesized that a negative EI (vocabulary scores being greater than efficiency test scores) will be obtained. The test was originally standardized on brain-injured patients (as the group likely to show most deterioration), and normals. It was later applied to schizophrenics (Babcock, 1933), and since then to many other groups by other authors. Babcock presented evidence (1930, 1933) to show that the EI was related positively to the amount of deterioration (assessed clinically), and to changes in status over a period of time.

(ii) *The Hunt-Minnesota Test for Organic Brain Damage* was first described by Hunt (1943). The subject's score on a vocabulary test is compared with his score on a number of learning tests (involving paired associates of words and designs) and a *T* score derived, high *T* scores being associated with brain damage. Although the test was constructed as a test of brain damage it is obviously based on the same principle as the Babcock-Levy test, the main difference being that it appears to assume that non-brain-damaged psychiatric patients will behave like normal subjects, although Babcock's earlier study of schizophrenics had already suggested that this would be unlikely.

(iii) *The Shipley-Hartford-Retreat Scale* (Shipley, 1940) consists of a multiple-choice form vocabulary test and a set of abstract reasoning problems. A Conceptual Quotient (*CQ*) is derived from these two measures, low *CQ*'s being associated with impairment. Mental age norms were established on 1,046 young subjects who had been given a group intelligence test. The test was validated on groups of psychotic and brain-damaged patients (Shipley and Burlingame, 1941).

A number of studies have employed the rationale in a more or less similar way to the major studies reported above.

Thus, some authors have compared the Binet Vocabulary score (expressed as a MA) with the MA computed from the remaining tests. Davidson (1937) found a difference of -3.6 months of MA ($\sigma 17.3$) for normals and -30.4 ($\sigma 24.4$) for schizophrenics using this method. The schizophrenic vocabulary MA was significantly different from the Binet MA and the discrepancy significantly larger than that for the controls. In a subsequent study (Davidson, 1939) he confirmed the previous findings with schizophrenics and found large discrepancies also for manic-depressives and psychotic epileptics.

Using the same technique, Malamud and Palmer (1938) tested 300 patients (100 schizophrenics, 100 organics and 100 defectives) and found large discrepancies between Vocabulary MA and Binet MA for both the schizophrenics and the organics but not for the defectives (showing that the discrepancies were not solely a function of low intelligence). Rabin (1944) in a study of 268 cases

(including 90 schizophrenics) found that the discrepancy between Vocabulary and IQ was large (about 20 points) for all groups except the non-psychotic.

A careful study was carried out along these lines by Altman and Shakow (1937) who compared the mean discrepancy scores for schizophrenics, normals and delinquents, matched for age, education and Binet MA. In both co-operative and non-co-operative schizophrenics a significant discrepancy in favour of vocabulary was observed, with normals showing the reverse tendency. In a later study, Shakow (1946) confirmed these results for four groups of schizophrenics and several groups of normals.

A rather different technique was applied by Simmins (1933). She compared the scores of 116 psychotic patients on a series of "g" tests with their scores on the Binet Vocabulary. For 70 of the patients for whom the measure could be used, 50.5 per cent. showed deterioration. "g"-Deterioration scores showed good agreement with independent ratings of severity of illness. In a subsequent study, 86 per cent. of manics showed "g"-deterioration, but only 22 per cent. of schizophrenics, while no neurotics showed "g"-deterioration.

A number of studies have been reported which utilize the Wechsler Vocabulary and compare it with one or more subtest scores from the remainder of the battery. It is not always clear, however, whether such comparisons are meant to be a measure of deterioration or are a simple form of scatter analysis, the pattern being characteristic of the group and not necessarily resulting from deterioration. These studies have been conveniently summarized by Rogers (1951). Most of the signs are taken from Rapaport *et al.* (1945) and Wechsler (1944). Rogers tested these signs by comparing their percentage incidence in a group of 100 neurotics and 83 schizophrenics. He found the following differences had a significantly different incidence in the two groups.

	Per cent.
Vocabulary > Comprehension	(49 schizophrenics; 19 neurotics)
Vocabulary 3+ > Similarities	(22 schizophrenics; 11 neurotics)
Vocabulary 2+ > Arithmetic	(40 schizophrenics; 23 neurotics)
Vocabulary > Picture Arrangement	(60 schizophrenics; 39 neurotics)

A number of studies also utilizing the Wechsler have been reported by Hunt and his colleagues. In the first of these, Hunt *et al.* (1948a) compared Vocabulary score with Comprehension and Similarities score. They tested young and old normals, young feeble-minded, and schizophrenics; and tested precise predictions about each group. As hypothesized, they found that large percentages of schizophrenics (62 per cent.) and old normals (82 per cent.) showed average C+S score less than vocabulary, but that this was characteristic of only 19 per cent. of young normals and 19 per cent. of young defectives. In a further study (Hunt *et al.*, 1948b) they found essentially the same results for new samples and derived deterioration indices for the four groups. The old normals obtained the largest mean scatter index (-3.48 , $\sigma 2.41$), the schizophrenics, the next largest (-1.70 , $\sigma 2.95$). In yet a further study Hunt and French (1949a) confirmed the previous results for a group of 42 schizophrenics aged 17-38, the comparisons this time being between Vocabulary and a group of non-verbal tests (e.g. Picture Arrangement). In a still later study, Hunt and French (1952) found significant differences in scatter between various groups, comparing vocabulary score with score on the Navy-Northwestern Matrices Test; 80 per cent of schizophrenics showed scatter, as did 50 per cent. of paretics, compared with only 14 per cent. of normal controls.

The most extensive study utilizing Vocabulary in this way is that by

Rapaport *et al.* (1945). They compared mean Vocabulary score with mean score on other Wechsler subtests for various diagnostic groups. They also compared Vocabulary score with scores on other tests in many different ways and found characteristic patterns.

Thus we can see that the use of vocabulary in the measurement of mental deterioration has had a long history, and is still very much alive both in research work and clinically. Nor is this rationale confined only to American and English psychology; for example, Pichot and Rennes (1952) recently gave two tests, one a deterioration test, the other a non-deterioration test to 448 males aged 20–24 and derived from the results a table which takes into account the correlation between the two tests and is used to calculate the probability that a difference in scores on the two tests is due to pathological deterioration.

However, criticisms concerning the validity of the method have been voiced from time to time. While many of the early studies reported results confirming the validity of the tests (particularly in the case of the Babcock EI, the test which has stimulated most research), recent studies have been more carefully controlled and many objections have been lodged against the three tests as a result. This paper is not concerned with those studies which criticize the validity and reliability of the tests or their inadequate standardization except in so far as they are related to the problem under discussion, i.e. the use of Vocabulary (especially as many of these studies relating to the use of the Hunt-Minnesota and Shipley-Hartford tests have been reviewed by the author (Yates, 1954).

Five principal criticisms have been brought against these tests and against the method in general of using Vocabulary in this way.

(i) It has been argued that the apparent resistance of vocabulary to decline by comparison with other tests is a function of the scoring method employed. Yacorzynski (1941) argued that whereas most of the so-called deterioration tests involved a response which was clearly right or clearly wrong (an all or none response as it were, in which any deterioration in ability would change a positive score into a zero score), in the Vocabulary test, a subject could, owing to the subjectivity and leniency of the scoring, obtain the same score with an inferior as with a superior response. Hence, deterioration in Vocabulary would not be reflected in the score. This is equivalent to predicting that deterioration in vocabulary would be apparent if the test were scored in a more rigorous way. Research carried out on this aspect of the problem will be reported later.

(ii) Another criticism has been that in fact vocabulary, even when loosely scored, does deteriorate, at least in certain types of illness. For instance Gottschalk (1942) tested 35 psychotic epileptics, using a revised Babcock scale and found that the deterioration estimate correlated with clinical estimates of deterioration quite highly ($r = +0.63$). Nevertheless, he was forced to conclude that "the Babcock deterioration scale is not a reliable quantitative measure of deterioration in any but mild cases . . .", the reason being that "in some of the most deteriorated cases in this study the index of efficiency was practically 0.0". Although Gottschalk does not specifically say so, it seems reasonable to suppose that these patients were deteriorated on all measures, including Vocabulary, rather than that they showed no deterioration at all. Likewise, Simmins (1933) found that Vocabulary could not be used as an estimate of previous level for GPI patients or for epileptics, again presumably because such patients showed a decline in vocabulary level equal to that observed on other tests. Many other studies have been reported showing decline of vocabulary in mental patients. These will be discussed later.

(iii) A further criticism which has been made as a result of carefully controlled experiments is that the use of this method may lead in certain instances to a false positive or false negative diagnosis with regard to deterioration (or of brain damage on the Hunt-Minnesota). Thus, Juckem and Wold (1948) showed that false-positives would be frequent on the Hunt-Minnesota in superior college students, while Manson and Grayson (1947) suggested that a spuriously high Vocabulary score on the Shipley-Hartford was responsible for the very low CQ's obtained by many of their military prisoners. Similar results were reported by Merrill and Heathers (1952) for the Wechsler Vocabulary when compared with other subtest scores.

(iv) Criticisms have also been made of these tests concerning their failure to control for differences in age (this criticism does not apply to the Hunt-Minnesota). Thus, in two studies Hunt *et al.* (1948a, 1948b) showed that over 80 per cent. of aged normals showed a discrepancy between Vocabulary and the average of Comprehension and Similarities scores, compared with 57 per cent. of schizophrenics. Gilbert (1935) found a very large negative EI for her 60 year old normals as compared with her 20 year old normals, even when making allowances for increase in vocabulary with age. Similarly Botwinick and Birren (1951a) found a mean EI of -5.3 for a normal group aged 60-70; in a group of normal hospitalized aged studied by Fox and Birren (1950b) the mean EI was -5.3 . Davidson (1939) found that the discrepancy between Vocabulary MA and Binet MA increased steadily with age. Since the majority of studies reporting favourably on the use of these tests (the Babcock, for instance) fail to control for age differences between controls and pathological groups and, since the pathological groups are usually older than the normals, these findings and criticisms are obviously important.

(v) A rather different criticism was made by Altman and Shakow (1937) and Shakow (1946). Although in both studies it was found that schizophrenics obtained a significantly higher mean discrepancy score than normal matched controls, the fact that the discrepancy score did not correlate with period of hospitalization, estimates of deterioration by psychiatrist, education or age, was taken to indicate that the discrepancies were not related to deterioration as such, but to some other factor, possibly the specific disease process itself. While these findings assume that the clinical estimates of deterioration are reliable, the findings in general constitute an important source of criticism.

It is clear, therefore, that there is conflicting evidence as to whether Babcock's original hypothesis has stood up to critical examination. It is possible that the relatively poor construction and standardization of these tests has obscured the potential validity of the technique. An evaluation of the problems and difficulties involved, both from a theoretical and practical point of view, would therefore seem to be a worthwhile undertaking.

3. TYPES OF VOCABULARY TESTS

Few writers have considered the many different kinds of vocabulary test which have been used at one time and another, and their relationship to each other. Vocabulary tests may be classified in many different ways. Perhaps the basic classification would be:

(a) Those tests which involve recall.

(b) Those tests which involve recognition (multiple choice).

The merits of these two types of tests have long been argued. The multiple choice type of test can be more objectively and reliably scored and can often be given to dysphasic subjects who are unable to express themselves verbally.

On the other hand the choice of correct answers is determined by the examiner. The multiple choice test also involves particular problems with regard to the placement of the choice responses. Raven and Walshaw (1944) have pointed out some of these difficulties and Atwell and Wells (1937) for example, showed clearly the problems involved in the construction of their multiple choice test where five possible responses were given for each word. The choice words consisted of one definition (correct response), one opposite, two misleads, and one absurdity, the position of the correct response word being determined by chance. Seashore and Eckerson (1940), however, in discussing the problems involved in the construction of a vocabulary test pointed out that the inclusion of an opposite meaning among the response choices might give the subject an important clue to the meaning of the stimulus word. Recall tests on the other hand have the disadvantage of being difficult to score reliably, but it is claimed that this is compensated for by the fact that the test reveals different modes of expression and may be used as an indicator of thought disorder, dysphasia and even as a projective device.

(a) *Tests Involving Recall*

Many different kinds of tests have been used in this way, which purport to be measures of vocabulary.

(i) Tests in which the subject is presented with a word and asked to say what it means. The commonest tests of this nature are, of course, the Wechsler-Bellevue (Wechsler, 1944), the Stanford Binet (Terman and Merrill, 1937) and the Mill Hill Recall Vocabulary (Raven, 1948a).

(ii) Tests in which the subject is asked to construct a sentence with the given word in it.

(iii) Tests in which the subject is asked to say as many words as possible in a given time (tests of word fluency). The task may be unrestricted as to content, or may be referred to a specific content.

(iv) It has even been suggested that simply measuring speed of association to stimulus words will serve as a valid index of vocabulary level. Tinker *et al.* (1940), for example, found a significant association between the speed of response to stimulus words and the definitions of such words, provided the words in the two tests were the same.

(v) The use of heteronyms (i.e. words with different meanings according to their pronunciation, such as *close*, *lead*, *abstract*, etc.) may be used as a measure of vocabulary level according to Severn (1949). He presents a list of 54 words which he found most useful for this purpose.

(vi) On the other hand, Capps (1939) employed the Homograph test in which each word that was used had a minimum of five different meanings, e.g. "bill" could be defined as a boy's name, a dollar bill, charges due, etc. Lovell (1941), in an extension of this method, contrasted the ability to give the "commonest" meaning of a word with the ability to give "multiple meanings" of the same word.

(b) *Tests Involving Recognition (Multiple Choice)*

(i) The use of synonyms is the commonest form of multiple choice test. In such a test, the subject has to choose and underline the correct response to the stimulus word from a choice of words. Perhaps the best known examples of such tests in clinical work are the Mill Hill Vocabulary Synonym Test (Raven, 1948a), and the vocabulary tests of the Hunt-Minnesota Test (Hunt, 1943) and the Shipley-Hartford-Retreat Scale (Shipley, 1940). Capps (1939) also used a synonym test.

(ii) Conversely, the antonym test has been used as a measure of vocabulary level, e.g. by Capps (1939) in the study quoted.

(iii) Capps (1939) also developed a categorization multiple choice test in which the subject was required to classify several *species* words which were related to a common *genus* word, e.g.

Head: colon, low, *face*, stone, *ear*, dress, road, *hair*.

(iv) Another type of multiple choice test (going back as far as Ebbinghaus) is the incomplete sentence test. The subject is given a sentence in which there is a blank and is asked to fill in the missing word from a choice of words. This measure was proposed by Gerstein (1949) as an extension of the Wechsler vocabulary test. A similar test is also contained in the N.I.I.P. group test 33, while Capps's (1939) sentence usage test falls into the same category.

It is clear that most of these tests are interchangeable, i.e. a test which involved recall could be presented in recognition form. In only a few cases, however, does this appear to have been tried out. The most satisfactory example is undoubtedly the Mill Hill Vocabulary test developed by Raven (1948a). In this test there are two subtests, each consisting of 44 words. In one part the subject defines each word in writing, in the other he chooses the correct synonym from a choice of six. The two parts of the test are interchangeable, a feature which is very useful from the point of view of test-retest. Atwell and Wells (1937) used a multiple choice version of the Stanford-Binet Vocabulary.

The above classification into recall versus recognition vocabulary is useful but is not the only way in which vocabulary tests have been classified. Other appropriate classifications which have been discussed from time to time are mentioned briefly below:

(i) Vocabulary tests may be either *verbal* or *non-verbal*. This is an important point which has been overlooked too frequently. It is often extremely difficult to obtain an estimate of a patient's vocabulary level in the conventional way if he is suffering from receptive or expressive dysphasia and alternative techniques of measurement are not too readily available. Weisenberg, Roe and McBride (1936) for example in their study of dysphasic patients were forced to resort to the use of the Gate's Reading Test which consists of pictures only. More recently Ammons and his colleagues have developed a non-verbal test of the oral recognition type which does not involve the use of speech, although it does require receptive ability. This test (Ammons and Ammons, 1948), which is based on Van Alstyne's (1929) early work, consists of 16 plates each containing four pictures; for each plate there are 14 to 21 words of varying levels of difficulty, each word applying to only one picture. It has been extensively standardized.

(ii) A number of authors have divided vocabulary into *speaking*, *reading*, and *writing*, and have pointed out some of the differences between these modalities (Irmina, 1927; Anderson and Fairbanks, 1937; Burton, 1944; Schubert, 1953).

These comparisons are similar to the distinction drawn by other authors between *aural* and *visual* vocabulary. In this connection Wesman and Seashore (1949) have pointed out the necessity for distinguishing between fluency and complexity of vocabulary. Thus in the vocabulary tests constructed on the frequency of occurrence of words found in literature, many simple words will be missing because of their rare appearance in books, although they may be known to almost everyone, e.g. Zoo. Here again, the distinction between reading and speaking vocabulary is important. Such a difficulty is also involved in the distinction between *actual* as opposed to *estimated* vocabulary. Measures

based on frequency counts may underestimate vocabulary level. Other authors contrasting word knowledge with word frequency include Seashore and Eckerson (1940), Kirkpatrick and Cureton (1949), Dolch (1951) and Vernon (1950).

(iii) Severn (1949) has contrasted *active* with *passive* vocabulary, and suggested a way for measuring this. His multiple choice method represents a possible objectification of the main point made by the recall enthusiasts—the use of vocabulary as a measure of factors other than vocabulary itself. Morgan and Oberdeck (1930) also contrasted active with passive vocabulary and showed that passive vocabulary exceeded active vocabulary to a considerable degree in normal subjects.

It is clear that a large number of different vocabulary tests have been used at one time or another in the field of mental measurement. Two important questions immediately arise concerned with the degree to which different vocabulary tests measure the same ability and the validity of the vocabulary test as a measure of intelligence.

4. RELATIONSHIPS BETWEEN VOCABULARY TESTS

Surprisingly little systematic work has been carried out on the relationship between different measures of vocabulary, most workers seeming to assume that any measure of vocabulary will suffice for the purpose, provided it involves the use of words. Fortunately a certain amount of careful factorial work has been carried out which throws some light on this problem. Thurstone (1938, 1941) for example, in a number of factorial studies isolated two factors which appear to be important. One of these is the verbal-comprehension factor which is involved in tests of understanding the meaning of words; the other is a word-fluency factor in tests involving the production of words to fit a specified set. Thurstone worked with students but similar results for adults were reported by Johnson and Reynolds (1941); their two factors were selection of responses and flow of response.

It would thus appear that word fluency is relatively independent of word knowledge (if by the latter we mean understanding the meaning of words) and this result received further confirmation in the study by Gewirtz (1948a) using children. He used eight tests (involving ten measures) of word fluency and calculated correlations between these tests and the Stanford Binet Vocabulary. For 38 cases, 7 of the 10 correlations were less than 0.2 and only one reached a value of 0.5, only three correlations attaining significance.

On the whole, therefore, it would seem that most workers agree in isolating two aspects of vocabulary measurement—word knowledge and word fluency. That agreement is not perfect may be due primarily to the low reliability of tests of word fluency (which are usually very short tests) and to the possibility that word fluency itself may not be a unitary factor. Gewirtz (1948a), for instance, in the study quoted, obtained on the whole low (but positive) inter-correlations between his various fluency tests ranging from .08 to .70 indicating much specific variance to the tests (again low reliability of the individual tests may account for the low intercorrelations).

In view of the large amount of agreement between different investigators, it is unnecessary to quote in detail results on the reliability and validity of different kinds of vocabulary tests which are not specifically tests of word fluency. In general it may be said that the correlations rarely fall below .8 and the average intercorrelation is probably about .9. A few illustrative examples will suffice.

Ammons and his co-workers have reported a large number of correlations between the two forms (A and B) of the Full Range Picture Vocabulary Test

(FRPVT) and the Binet Vocabulary. In one study, for example, using 120 pre-school children (Ammons and Homes, 1949), they report an overall correlation between Form A and the Binet vocabulary of $\cdot 85$ and between Form B and the Binet vocabulary of $\cdot 83$. In another study using 71 rural children (Ammons and Manahan, 1950), the respective correlations were $\cdot 88$ and $\cdot 85$. Other studies by these authors yielded similar coefficients. Similarly Capps (1939), who used seven measures of vocabulary reported inter-test correlations ranging from $\cdot 85$ to $\cdot 91$. Other authors reporting high intercorrelations between different kinds of vocabulary tests, include Garrison (1930) and Sims (1929).

Two studies deserve special mention for the large number of subjects on which they are based. Foulds (1949) reports a correlation of $\cdot 93$ between the Binet vocabulary and the Mill Hill vocabulary for over 3,000 subjects aged 16-65. Dunsdon and Roberts (1955) tested all children in Bristol between the ages of 5 to 14, whose birthday was on the first of any month. For four tests (WISC vocabulary, Binet L vocabulary, Mill Hill A and B recall vocabularies) they report correlations ranging from $\cdot 82$ to $\cdot 87$ for boys and from $\cdot 77$ to $\cdot 83$ for girls.

Such correlations are, of course, influenced by the reliability of the individual vocabulary tests being compared. In this respect (again with the exception of word fluency tests), reliability coefficients tend to be satisfactorily high. A number of examples will suffice to illustrate the point.

One method of estimating reliability is by means of the test-retest method. Canter (1951) reported the reliability of the Wechsler vocabulary measured over a period of six months to be $\cdot 83$ for 38 normal controls. Hamister (1949) retesting over a period of 1 week or 1 month found a correlation of $\cdot 90$ for a group of neuropsychiatric patients, the correlation being as high for the schizophrenics as for the other patients. Raven (1948b) reports the test-retest reliability of the Mill Hill vocabulary test at different ages. At age 40-49 it was as high as $\cdot 98$, while at 50+ years it was still $\cdot 90$. Corsini (1951) found an average correlation of $\cdot 90$ for five groups of subjects on the Immediate Test.

Some authors have argued that, owing to the changes of status in patients which can take place over a period of time, test-retest correlations are not very satisfactory, and have resorted to split-half correlations in an attempt to overcome the difficulty. Webb and de Haan (1951), for example, report split-half reliabilities of $\cdot 94$ (normals) and $\cdot 91$ (paranoid schizophrenics) for the Wechsler vocabulary. Botwinick (1953) showed that the correlation was as high in the case of old normals ($\cdot 96$) and seniles ($\cdot 94$) as in young normals ($\cdot 94$); this was confirmed by Finkelstein *et al.* (1952), who found that for eight age groups of a general hospital population, all reliabilities were $\cdot 90$ or higher, the average being $\cdot 93$. Ammons and Huth (1949) reported a correlation of $\cdot 97$ for the Full Range Picture Vocabulary Test.

Intercorrelations of alternate forms of a vocabulary test are also high. Thus, Tinker *et al.* (1940) obtained a correlation of $\cdot 94$ for Forms A and B of the Minnesota Reading Examination for college students. Raven and Walshaw (1944) reported a coefficient of $\cdot 95$ between the two parts of the Mill Hill vocabulary test. For the Full Range Picture Vocabulary Test, Ammons and his colleagues have reported some very high correlations between Forms A and B, e.g. $\cdot 97$ for 80 negro children (Coppinger and Ammons, 1952), $\cdot 86$ for 80 Spanish-American children (Ammons and Aguero, 1950), $\cdot 93$ for 120 white children of pre-school age (Ammons and Homes, 1949), and $\cdot 987$ for 71 rural children (Ammons and Manahan, 1950). Van Alstyne (1929), in her original version of the test found a correlation of $\cdot 87$.

Lower correlations have occasionally been reported, however, e.g. by Hunt and French (1949b) for two short forms (V1 and V2) of the Stanford-Binet ($r = .78$)—this may have been due, however, to the exceptional brevity of these short forms. For two tests involving, on the one hand commonest meanings, and on the other hand multiple choice meanings, Lovell (1941) reported a combined correlation of only .68. Dolch (1932) found little agreement between the results of tests in which 40 children were asked first of all to mark with a tick all words unknown and with a question mark all words that they were uncertain of in a group of 70; and then were presented with the same 70 words immediately afterwards in multiple choice form.

Allowing for the fact that the maximum intercorrelation between different kinds of vocabulary tests depends on the reliability of the individual tests and that little account has usually been taken of the results of factorial studies in the construction of such tests, the results discussed above indicate that the various vocabulary tests used by different authors do seem to measure roughly the same factor, and have a great deal in common. Furthermore, vocabulary scores seem to be highly reliable in both normal and abnormal subjects; and in old people as well as in young.

5. VOCABULARY AS A MEASURE OF INTELLIGENCE

The second major problem concerns the relationship between measures of vocabulary ability and measures of intelligence. Many studies have been published showing the relationship between vocabulary and intelligence and the results may be summarized as follows:

(i) There seems little doubt that measures of vocabulary do have a good deal in common with the verbal-type intelligence test (Cureton, 1949). Thus, for instance, Thurstone (1941) found a correlation of .72 between his verbal comprehension factor and his "g" factor. Correlations greater than .90 between Binet vocabulary and MA have been reported by Spache (1943), Oberlin (1937), Elwood (1939) and Dunsdon and Roberts (1953); correlations between .8 and .9 by Mahan and Witmer (1936), White (1942), McNemar (1942) and Feifel and Lorge (1950). In general, as Terman and Merrill (1937) say, the Binet vocabulary test "agrees to a high degree with the mental age of rating on the scale as a whole; correlations for single age groups range from .65 to .91 with an average of .81". In a similar study Raven (1948b) found that for ages 6-13, Mill Hill Vocabulary correlated .926 with Binet MA.

Lewinski (1948) reported a correlation between the Wechsler vocabulary subtest and the Wechsler Verbal Scale of .809 and Corsini (1951) a correlation of .91 between the Immediate Test and the Wechsler Verbal WS.

(ii) On the other hand, the reported correlations between vocabulary measures and measures of intelligence which employ non-verbal performance tests tend to be much lower. Thus Lewinski (1948) reported a correlation of only .684 between the Wechsler vocabulary subtest and the Wechsler Performance Scale IQ.

(iii) Where the intelligence test is a composite measure, using both verbal and non-verbal items, the correlation with vocabulary tends to be rather low. Lewinski (1946) reported the correlation between the Shipley-Hartford vocabulary and the Wechsler FS IQ to be only .877; and this was supported by Garfield and Fey (1948) who found a correlation of only .49 for 100 patients. Wilson (1937) correlated a vocabulary test with 76 other measures, including mental tests, yet the highest correlation he reports is .61. Altus (1946) found, on the other hand, that the correlation between the Binet vocabulary and the

AGCT-Ic test was $\cdot 88$, and Rabin (1944) that the correlation with W-B IQ was $\cdot 78$. Corsini (1951) also reports a high correlation of $\cdot 90$ between the Immediate Test and Wechsler FS IQ for 300 subjects and of $\cdot 84$ with the W-B Form II WS for 100 subjects. Using a short form of the Binet Vocabulary, however, Hunt and French (1949b) found correlations of only $\cdot 67$ and $\cdot 72$ with the Navy G.C.T. for V1 and V2 respectively; while Hunt *et al.* (1948c) report a correlation of $\cdot 80$ between V1 and Navy G.C.T. and $\cdot 65$ between V1 and a short form of the W-B.

(iv) Little work has been reported on the correlation between intelligence tests and non-verbal vocabulary tests. Ammons and Homes (1949) found that the FRPVT correlated $\cdot 85$ (Form A) and $\cdot 83$ (Form B) with the Binet MA.

(v) When the intelligence test is a non-verbal "pure" test of "g" such as the Matrices test, correlations tend to be surprisingly low. Desai (1955) found that for 190 psychiatric patients, the correlation between Wechsler vocabulary and Matrices score was only $\cdot 37$. Raven (1948b) found that the correlation between the Mill Hill vocabulary and Matrices score varied from: $\cdot 60$ (at age 30), $\cdot 51$ (ages 30–39), $\cdot 45$ (ages 40–49), to $\cdot 44$ (ages 50+). His finding that the correlation declines rather sharply with age is in agreement with that of Rabin (1944).

From a survey of the above results it seems, therefore that the degree to which vocabulary measures general intelligence depends to a large extent upon the type of intelligence test which is employed. However, even where the intelligence test closely approximates the vocabulary test in the type of material used, that is to say, in the verbal intelligence type of test the correlation rarely rises above $\cdot 9$ and probably averages between $\cdot 8$ and $\cdot 85$. This means, of course, that the two tests in fact have only about 60–70 per cent. of their variance in common and from this it follows that the accuracy with which intelligence level could be predicted from a knowledge of vocabulary level is not very great in individual cases. This is borne out in those few instances where the task has been attempted. The main relevant study of this nature is that by Lewinski (1948) who used over 1,000 cases. He calculated regression equations for predicting intelligence level on the Wechsler vocabulary and found relatively large SE_{est} , i.e. $9\cdot 67$, $12\cdot 25$ and $9\cdot 83$ for Verbal, Performance and Total scales respectively. As an example of the amount of error involved (using Lewinski's table, page 269) a vocabulary score of 22 would mean that the best prediction of a subject's Performance Scale I.Q. would be 100. However, at the 5 per cent. level of confidence the subject's true Performance Scale I.Q. might fall anywhere between $100 \pm 12\cdot 25 \times 1\cdot 96$, i.e. between 80 and 120. For practical purposes, therefore the range of error is extremely large though it should be borne in mind that an estimate of intelligence from the Performance Scale test itself has a margin of error which is relatively large.

This conclusion is supported by a recent study by Cureton (1954) who found that, in predicting Binet MA from vocabulary score "we can place some confidence in the first figure, or the first two figures, if the I.Q. is 100 or over, but none in the last figure. The 95 per cent. confidence limits for a given vocabulary I.Q. are approximately plus or minus 20 points." Cureton's SE_{est} of $9\cdot 72$ for the Binet vocabulary agrees closely with Lewinski's SE_{est} of $9\cdot 67$ when predicting from the Wechsler vocabulary to the Verbal Scale. Spache (1943) and White (1942) have attempted similar tasks. The degree of accuracy attainable is, of course, much less for some other tests and virtually nil in such cases as the Mill Hill Vocabulary and the Matrices tests.

Although it is difficult to predict intelligence from knowledge of vocabulary

it is well nigh impossible to predict intelligence level from the subject's score on a word fluency test. Gewirtz (1948a) reported correlations between nine fluency measures and Stanford-Binet MA and I.Q. Of 18 correlations only two were greater than .6 and the majority were less than .4. The highest correlation with mental age was with disjointed sentences. This is not unexpected since such a test is probably quite complex and would have a high "g" loading. While the trend of the correlations is undoubtedly positive, they are so low that prediction is impossible.

We may conclude this discussion, therefore, by stating that although vocabulary is probably the best single measure of intelligence that is available, nevertheless prediction from vocabulary level to intelligence level can only be made with a wide margin of error.

6. THE INFLUENCE ON VOCABULARY OF VARIOUS FACTORS

Having cleared the ground by a discussion on the nature of vocabulary tests and their relationship to measures of intelligence, we may now proceed to a consideration of the assumption that vocabulary is a relatively stable function as compared with other behavioural measures. Three beliefs are commonly held in this connection:

(1) That vocabulary is resistant to the normal ageing effects noticeable in most abilities (or even improves with age).

(2) That vocabulary is relatively unaffected by slight differences in education, culture, personality, etc.

(3) That vocabulary is resistant to the deteriorating effects of mental disorder.

These three beliefs will be considered in turn.

FACTORS INFLUENCING VOCABULARY IN NORMALS AND ABNORMALS

A review of the literature suggests that vocabulary, far from being an extremely stable ability, is quite remarkably affected even in normal subjects by a large number of factors, even when scored in the conventional manner criticized by Yacorzynski (1941).

(a) *Age*

That vocabulary score increases with age during childhood and early adult life is undisputed. The main controversy has centred around the question whether vocabulary remains constant in later adult life, increases or decreases. There is much less agreement on this point.

Experiments have shown that vocabulary level increases steadily and consistently throughout school life. Gansl (1939) found, in a study involving 3,306 New York City public school children in grades 3-8 a steady and fairly constant increase from lower to upper grades. Hamlin (1944) in a study of 656 boys and girls aged 7-15 constructed age progress curves for 9 different selections of 200 vocabulary items and found that the total vocabulary curve was a straight line, that a single curve is characteristic of a wide variety of vocabulary materials and that words of different concept and frequency level give the same age progress curves. Carlton (1942) confirmed these results for 216 feeble-minded persons aged 10.6-17.5, even when MA was held constant, i.e. CA as well as MA determines vocabulary score on the Binet. (Atwell and Wells (1937), however, using 1,400 cases concluded that grade level influenced vocabulary level to a greater degree than did age level.)

In two studies Dunsdon and Roberts (1953, 1955) confirmed these results on large numbers of children. For four vocabulary tests combined there was a

linear increase with age, the WISC vocabulary being the only single measure to show non-linearity. The correlation between vocabulary score and CA was .74. McNemar (1942) found that the growth curve showed slight negative acceleration but for the age range covered by Dunsdon and Roberts, his curve too was linear, i.e. vocabulary starts to level off at about the age of 15 or 16.

Careful recent experiments have also shown that in addition to a quantitative increase in the number of words actually defined during this period, the kind of definition (qualitative response) changes. Feifel and Lorge (1950) gave the Binet vocabulary to 900 children aged 6-14 and analysed their responses carefully by means of a five-fold classification (to be described more fully later). They found that younger children significantly more often employed the use, description and illustration, demonstration, inferior explanation and repetition types of response, whereas older children used significantly more often the synonym and explanation types of response. Younger children defined words more concretely, and older children more abstractly. On the other hand, Feifel (1952) in a further analysis of the same records found that "No sharply demarcated patterns characterizing stages in the child's development of thinking appear in this analysis of vocabulary errors". These results were confirmed by Kruglov (1953) in an ingenious modification of Feifel's technique in which the subject was asked to choose the "best" definition from a number of definitions of different qualitative level. Papania (1954) found similar results for a group of 50 institutionalized, endogenous, mentally retarded children aged 6-10.

Whether vocabulary goes on increasing with age during adult life is a point which has led to considerable disagreement. For the age range 20-80, there is good agreement that scores on recall types of test change little. Thus, Lewinski (1948), using 1,000 cases, showed that the mean Wechsler vocabulary score rose by only two points between the ages of 17 and 40 ($r = +.17$). Howell (1955) tested 397 subjects aged 20-89 and found no changes even in the oldest decade. Fox and Birren (1950b), Madonick and Solomon (1947), and Rabin (1945) also found no decline in vocabulary in the sixties as compared with the twenties, using the Wechsler vocabulary. Other workers report similar results with other recall tests (Weisenburg *et al.*, 1936; Miles, 1939; Hunt, 1943; Roe and Shakow, 1942; Fox, 1947).

A few workers report increases in vocabulary with age. Thus Gilbert (1935) compared a group of 20-year-olds with a group of 60-year-olds and found a rise in vocabulary between the ages of 20 and 60 years. Sward (1945) tested two groups of University lecturers and professors, one group aged 60-80, and one aged 25-35. He concluded that "in word knowledge of general vocabulary, the senescent are uniformly superior to the younger middle-aged". Likewise, Sorenson (1933) tested approximately 75 adults attending University evening classes, grouped in 5-year intervals from ages 15-54. On a vocabulary test of 480 items he found that between 20-24 and 50-54 an increase in vocabulary of $+ .56\sigma$ of the scores of 5,500 subjects from which the sample of 641 subjects was drawn. Heston and Cannell (1941) tested 643 subjects aged 15-76 and reported a rapid increase from 15-20, with a progressive rise up to 55, followed by a slight decline. Christian and Paterson (1936) compared college freshmen with their parents on a 120-item timed vocabulary test and found that when only the first sixty items were compared the parents had a significantly higher vocabulary.

Some of the above authors used multiple-choice tests and indeed it seems established that *recognition* vocabulary continues to increase longer than recall vocabulary. Both Foulds (1949) and Raven (1948) report that score on the Mill

Hill Vocabulary Scale increases up to about 25–30 while Raven points out that it remains constant for a further 25 years and then declines slightly. Similarly, Garfield and Blek (1952) studied three groups of single females matched roughly for I.Q., education and occupation. The groups were aged 20–30, 40–50, and 60–70. They found a significant rise in Shipley-Hartford vocabulary mean score from group to group.

It seems established then that from 20–60, vocabulary either remains stationary or increases slightly. Results after the age of sixty are frequently vitiated by the use of very small numbers (Lewinski, 1948; Sorenson, 1933) and clear conclusions are difficult to draw. Fox and Birren (1949) tested 216 institutionalized old people with a mean age of 71 and found a mean I.Q. of 92 and mean vocabulary WS of 8, i.e. $\cdot 7\sigma$ lower than Wechsler's 20–24 year old normals on both tests. They concluded that vocabulary tended to decline at about the same rate as FS I.Q. Similarly Carter (1931) reported a slight decline with age in normals. On the other hand, Howell (1955) found no decline even up to 90 years of age and other authors (Fox and Birren, 1950b; Fox, 1947) found similar results.

Changes with age in abnormal adults have also been reported. Carter (1931), Fox and Birren (1949) and Brown (1948), have all reported decreases in vocabulary in institutionalized old people. Rabin (1947) in a study of 404 abnormals, found a slow but steady increase with age, from 49·3 below 20 years to 57·5 at age 60+. Vocabulary changes within sub-groups were unclear, except that neurotics and a group called "other organics" seemed to show regular increases with age. In another study, Rabin (1944) found similar results. Jastak (1953) found that vocabulary increased up to the age of 40–51 and then declined.

If vocabulary does increase with age, then clearly this fact will affect the use of discrepancy scores, which will also increase with age. Thus Shakow (1946) found that the discrepancy between Binet vocabulary and MA increased with age from 4 months at age 20–29 to 27 months at age 50–59 ($r = +\cdot 72$). "The discrepancies in the fifties are as great as any found between a psychotic and a normal group." Rabin (1944) reported a similar finding.

Three general comments may be made on the above conflicting results. In the first place, vocabulary level can be influenced by whether or not the test is timed. Christian and Paterson (1936) and Sorenson (1933) both found that older subjects completed fewer items over a long period (1 hour), but that they tended to work faster and more accurately if the test was short. Secondly, it seems that whether or not vocabulary increases with age is in part a function of whether or not the subject's occupation seems likely to lead to an increased vocabulary during his lifetime. Thus, most of the studies showing increases with age used highly selected groups as subjects (Sward, 1945; Sorenson, 1933; Garfield and Blek, 1952). On the other hand, studies showing little increase tended to use more heterogeneous samples, including many subjects who would not be expected to increase their vocabulary very much (Lewinski, 1948; Fox, 1947; Fox and Birren, 1949). Thirdly, the study of Shakow and Goldman (1938) showed clearly the difficulty of carrying out valid research in this field, where groups are compared which were educated at different times, often separated by 50 or 60 years. Spurious correlations between age and vocabulary may easily arise in this way. They compared grammar, high-school, and college-educated groups from 20–80 on mean vocabulary score and found a significant increase with age for all three levels of education. However, they also found that the grammar school group of 70-year-olds contained a higher proportion of very

intelligent people than did the 20-29-year-old group simply because fewer people in the older group tended to go to high school and college (and assuming that the distribution of intelligence in the population was the same then as now). The apparent increase with age, therefore, could be accounted for entirely in terms of differential intelligence at different age levels.

We may conclude that it seems to have been demonstrated that vocabulary tends to reach a peak level about the age of 17 (Lewinski, 1948) and to change little after that, possibly declining slightly from the age of 55,* depending perhaps also on the type of vocabulary test (recall or recognition) used. Vocabulary may, however, continue to increase throughout adult life in subjects in certain occupations. It is interesting to notice that Feifel (1949), using groups aged 15-29, 30-49 and 50-79 found no evidence of a decline in the quality of response with increased age comparable to the rise in quality in children. He concluded that "on the whole no clear differences appear to exist between the younger and older normals in their choice of types of responses".

(b) *Sex*

There is general agreement that sex differences in vocabulary are minimal. Much the most impressive study in this field is that by Dunsdon and Roberts (1955). Using four vocabulary tests on a large, carefully selected sample of children aged 5-15, they found that boys exceeded girls to a significant degree at all age levels on all four tests. The differences were so slight as to be unimportant in practice. This difference is apparent at the earliest age level, i.e. rate of growth of vocabulary is the same for boys as for girls. These results have been confirmed by many other authors (Gansl, 1939; Lévin and Stacey, 1951; Garrison, 1930; Bonnardel, 1951; Carter, 1931; and Norman, 1953), boys being usually found to be slightly superior to girls.

(c) *Education*

While it seems highly likely that size of vocabulary is influenced by the amount of education a person receives, no unequivocal demonstration of this has been reported and the relationship between age, education and vocabulary has not been clarified. While it is clearly incorrect to talk of vocabulary increasing due to age alone (maturation), nevertheless increase could take place due to factors other than education but directly related to increased age, e.g. increasing social contacts at school, increasing understanding, etc., and these could accurately be distinguished from educational influences as such. Most of the available studies indicate that education has a powerful influence on vocabulary. Thus Atwell and Wells (1937) in a study of 1,400 children from the 3rd grade to senior college level, concluded that grade level influenced vocabulary to a greater degree than did age level. Lewinski (1948) reported a correlation of $\cdot 572$ between vocabulary and last school grade, calculated for 1,000 male cases. Hartmann (1946) found a steady increase from a mean of 23.54 words for freshmen to 29.87 words for seniors, with appropriate intermediate scores (he did not report the statistical significance of these differences however). Shakow and Goldman (1938) reported a correlation of $\cdot 64$ between vocabulary and education but attributed it almost entirely to the indirect effects of mental level. Carter (1931) found for adults correlations of $\cdot 53$ (men) and $\cdot 49$ (women) with years

* The test manual for the Wechsler Adult Intelligence Scale (Wechsler, 1955) gives supplementary tables which show clearly that raw vocabulary scores decline fairly sharply with age from about 64 onwards. Thus, a WS of 10 (average) is given for a raw score of 38-44 at age 20-24, a raw score of 37-44 at age 55-64, but for a raw score of only 30-34 at age 70-74.

of education, Altus (1946) a correlation of $\cdot 67$ with years of schooling for 315 subjects, while Feifel and Lorge (1950) reported that the correlation with years of education rose from about $\cdot 3$ at age 7 to about $\cdot 6$ at age 14.

As far as the author is aware, no work has been reported which would be unequivocally relevant to this question, i.e. a study of subjects matched for intelligence, chronological age, grade level, and initial vocabulary level, who would then receive different kinds of education. A study by Altus (1950), however, threw some light on the problem. He took 156 negro and white illiterates with I.Q.s from 75 to 79 (mean 77) who varied on oral reading score from 0-34. With intelligence thus held constant, the mean Terman vocabulary score varies from 11.79 (oral reading score 0) to 17.00 (oral reading score 34) with appropriate intermediate values. Thus, if we accept degree of literacy as a measure of education, it would mean that vocabulary can vary with education independently of I.Q. level.

(d) *Level of Intelligence and Vocabulary*

Much research has indicated that in spite of the generally high correlations reported between vocabulary and other "g" estimates, some rather peculiar things happen at high and low levels of I.Q. which make the use of vocabulary as an estimate of present (in normal subjects) or previous (in abnormal subjects) level of I.Q. very dangerous and subject to serious error. This section is, therefore, concerned with the breakdown of the correlation between vocabulary and intelligence at high and low levels of intelligence.

It has been shown, for example, that highly intelligent subjects may have an even higher vocabulary score relative to their scores on non-vocabulary tests. Indeed, Wechsler (1944) has indicated that this applies generally to verbal items as compared with non-verbal items. Thus he reports that between the ages of 20 and 49, for I.Q.s of 120+ the Verbal was higher than the Performance I.Q. in 77.4 per cent. of cases. More particularly with reference to vocabulary, Juckem and Wold (1948) tested 50 college students and members of the scholastic staff who defined correctly 30 or more words of the Binet vocabulary. While their mean vocabulary score was 35.56, their mean *T* score on the Hunt-Minnesota test was 69.64—only 3 per cent. of Hunt's non-brain-damaged population scored as high as this. Sixty per cent. of Juckem and Wold's subjects had scores above Hunt's critical score of 66; to yield a mean *T* score of 50 (i.e. an average normal score) a vocabulary level of 21 was necessary for this group. Similarly, Merrill and Heathers (1952) compared data from their own study (429 University counselling students and 274 non-client volunteer male students) with those from Estes (1946) (102 Harvard volunteers) and Rapaport (1945) (54 Kansas patrolmen). The Full Scale mean I.Q.s of these three groups were 121, 127, and 116 respectively. Rapaport's patrolmen showed negative mean deviations from vocabulary on 8 out of 10 subjects; Estes' subjects on 6 out of 10, Merrill and Heathers' results tend to go the other way (i.e. vocabulary to be lower except for digits). In any event, in all three studies the use of vocabulary as a baseline indicated (as shown in a table constructed by Merrill and Heathers) that many false positives would be found if Wechsler's 3 points deviation criterion is used with vocabulary as a reference point.

Three other studies have confirmed these findings in subjects of high I.Q. Norman (1953) found that in subjects with I.Q. 120+, in males and females Vocabulary was significantly higher than Digit Span and significantly lower than Similarities; while in females Vocabulary was also significantly higher than Arithmetic. French and Hunt (1951) found that for the CVS scale, scatter

(i.e. V greater than C and S) was positively related to intelligence level; and that this relationship inflated the number of false positives obtained when the test was used as a screening device. Brody (1940) showed that the revised 1937 Binet vocabulary overestimated the subject's vocabulary level, especially in more intelligent patients. Raven (1948b) suggested that the rate of increase of verbal knowledge was greater for the more intelligent people.

One possible explanation for this very high vocabulary level in intelligent people was suggested by Hunt (1953) who found that the more intelligent students tended to make greater use of structural analysis of a word in defining it. Thus, when faced with an unfamiliar word, they might be able to "guess" its meaning correctly by analysing it into its component parts.

Likewise it has been shown that at below average intelligence levels particular care needs to be exercised. Thus Schnadt (1952) showed that for a low I.Q. group of subjects the subtests had a peculiar order of difficulty, e.g. Object Assembly tended to remain a high score, as did Comprehension. If these tests were used in comparison with vocabulary, any deterioration which might have taken place would fail perhaps to manifest itself. Bijou and Werner (1944) showed that at low I.Q. levels brain-damaged defectives correctly defined a significantly larger number of words than did a group of endogenous defectives. Louden (1933a) studied 28 dull subjects matched with bright children with respect to mental age and sex. "In every case differences which indicate the superiority of the 'bright' children over the 'dull' child of the same mental level" are shown. In a further study Louden (1933b) showed that using three criteria, List 1 of the Binet vocabulary is decidedly easier than List 2 at lower levels of I.Q., approximately equal in difficulty at the 14 year level and more difficult on the two adult levels.

These studies indicate that the use of vocabulary is fraught with problems at least at the upper and lower limits of intelligence.

(e) *Linguistic Differences; Social Class, Socio-economic Status and Occupation*

(i) *Linguistic Differences.* A large number of studies have concerned themselves with the relationship between linguistic characteristics and vocabulary. The most impressive of these in terms of numbers is that by Altus (1946), who reports mean Terman vocabulary scores for 7,303 illiterates of different racial descent. Six groups were compared and found to decline from a mean of 12.27 (whites) through coloured (11.32), Mexican (6.05), Phillipino (5.13) and Indian (5.10) to Chinese (3.44). Each group differed significantly from all others. These differences are, of course, due to a multitude of causes (e.g. educational differences) but they cannot be neglected.

Many studies have shown that Spanish/American children are retarded in their vocabulary. Thus Johnson (1938), found that Spanish/American high school pupils were retarded 7-12 months on various vocabulary tests. Ammons and Aguero (1950), testing 80 Spanish/American children on the FRPVT showed that at all age levels from 7 to 16½ years the Spanish children were retarded when compared with Anglo-American population norms, the discrepancy becoming larger with increasing age. On the Binet vocabulary the retardation was severe and about the same at all age levels. Sanchez (1934), pointed out the serious vocabulary difficulties which Spanish-speaking American children experience with the Binet in general.

Coppinger and Ammons (1952) using 80 Negro children in grades 1-8 found them about two years retarded compared with white children. They were even more retarded (3-5 years) on the Stanford-Binet vocabulary.

A number of studies have also shown that bilingual children tend to be retarded in vocabulary in their subsidiary language, and even in their primary language when compared with monoglot children. Apparently the two languages interfere with each other. Thus Barke and Williams (1938) gave the Thorndike Test of Word Knowledge, Forms A (in Welsh) and B (in English) to bilingual Welsh children. They found that while the two groups did not differ on a non-verbal I.Q. test, the bilinguals were inferior on verbal mental tests and on vocabulary tests, whether given in their native or second language. Saer (1923), in an earlier study found that the mean range of vocabulary scores of monoglot children in English was higher than that of bilingual children in either English or Welsh. Likewise Darcy (1946), indicated that bilingual children were retarded significantly on a vocabulary I.Q. test as compared with monolingual children closely matched for sex, socio-economic status and age. (Bilingual children were, however, significantly superior on a non-verbal test of intelligence, indicating that the vocabulary differences were not due to generally lower intelligence levels.) It may be concluded that linguistic differences have a powerful influence on vocabulary knowledge.

(ii) *Social Class and Socio-economic Status.* It is generally agreed that vocabulary level may be significantly influenced by social class differences and by socio-economic status. In general, Cuff (1935) reports that all correlations between social status and the number of different words written in 15 minutes (fluency), though low, were positive. Saltzman (1940) found that a group of children attending a "good" school and of high socio-economic status did better than a group of children attending a "poor" school and of low socio-economic status on tests involving vocabulary and verbal comprehension. The groups were matched for intelligence on a non-verbal test (Goodenough).

Schulman and Havighurst (1947), tested 90 children in one town, born in 1932 and aged 14 at the time of the test. The group was classified into social classes and scored on a socio-economic scale. They found, first, that children of higher social status made higher average scores, second, that the correlation between vocabulary and socio-economic status was $\cdot 46$. Dunsdon and Roberts (1955), in a large, carefully selected sample, found that the inclusion in the sample of children from independent and private schools exercised a very significant influence on the total mean. For the total sample, the mean vocabulary score was $11\cdot 98$; omitting the private school children it was only $11\cdot 37$; a very large drop considering the numbers involved.

Moore (1947) showed that when MA and CA were held constant, orphanage children were significantly inferior to non-orphanage children on the Smith-Williams Vocabulary Test and on 15 2-minute samples of speech. In an analysis of variance, the difference between the two groups due to environment was statistically significant for the vocabulary and speech content scores. Fleming (1942) compared children in an orphanage and children in their own homes and found that the latter increased their vocabulary knowledge at a significantly faster rate than the former.

Ammons and Manahan (1950) showed that these differences, however, might be much less marked if the vocabulary tests were non-verbal. They gave the FRPVT and the Binet Vocabulary Test to 72 rural children aged 6-17. They found some retardation on the Binet Vocabulary Test in the older age groups, when compared with a city population, but none on the FRPVT. In general it seems that rural/urban differences on vocabulary are small; Schulman and Havighurst (1947) and Bonnardel (1951) found no differences between city and country children on a vocabulary test.

We may conclude that social class and socio-economic status may significantly affect vocabulary knowledge.*

(iii) *Occupational Status*. Foulds (1949) showed the influence of occupation on vocabulary level. On the Mill Hill Vocabulary Scale, of directive and executive staff, 79 per cent. fell in the first quartile, 15 per cent. in the second, 6 per cent. in the third, none in the fourth. Of unskilled workers on the other hand, only 11 per cent. fell in the first quartile, 23 per cent. in the second, 19 per cent. in the third, and 47 per cent. in the fourth. Similar results were reported by Raven (1948b). These differences are probably primarily a function of other factors, of course (education, intelligence, etc.).

(f) *Personality*

Very little work has been reported concerning the influence of personality factors on vocabulary level, mainly, perhaps, because knowledge of the main dimensions of personality has not yet been utilized. The work that has been reported, however, has on the whole been of high quality.

The most important piece of research on this point was carried out by Himmelweit (1945). She took two groups of subjects, one group with a vocabulary level more than 1 sigma higher than Matrices score (Vocabulary+group); the other with Matrices more than 1 sigma higher than vocabulary (Matrices+group). In this way two groups were formed which were significantly different from each other in this respect. The percentage incidence of various traits was calculated for each group and significant differences tabulated. She found that subjects with Matrices+scores were significantly higher on the following variables than subjects with vocabulary+scores: unstable hysterical personality, hysterical attitude to illness, hysterical confusion symptoms, diagnosis hysteria, aetiology predominantly psychological causes. Subjects with vocabulary+scores were significantly higher on the following variables than subjects with Matrices+scores: obsessional personality, irritability, suicidal thoughts, consistently depressed, diagnosis depression or anxiety state, depressive symptoms. She concluded that hysterics tended to have high Matrices scores compared with their vocabulary level, and dysthymics vice versa. Petrie's (1952) results reinforce this conclusion. Following rostral leucotomy, she found an increase in extraversion (characteristic of hysterical neurotics) and with it a higher performance score in relation to verbal score on the Wechsler Scale than was the case prior to the operation. Slater (1945) compared equal numbers of obsessionals, miscellaneous neurotics, anxiety states and hysterics on the Matrices, Cattell IIA and IIB and Shipley Vocabulary. He found that the obsessionals had significantly higher Matrices and Cattell scores than any of the other groups and significantly higher vocabulary scores. The other groups did not differ among themselves. These three studies are very important, since they show marked vocabulary differences between groups not usually expected to show deterioration. Clearly, such differences would affect any measures of deterioration unless such factors were carefully allowed for.

Moldawsky and Moldawsky (1952) showed that the induction of anxiety in normal subjects could lead to a significant decrement in score on the Digit Span test and thus produce an apparent difference between it and vocabulary score which was unaffected by the induced anxiety. It seems, therefore, that anxiety in normal subjects could produce false positives in the test situation.

* The author has been unable to consult the important studies of Eels *et al.* (1951) which throw considerable light on the influence of cultural differences on intelligence tests in general and vocabulary tests in particular.

Selling and Stein (1934) found differences in the vocabulary responses of delinquent boys as compared with non-delinquent boys, differences which could, however, probably be attributed to the poor cultural and educational background of the delinquents rather than to the delinquency *per se*. Delinquency does tend, however, to encourage the development of a special vocabulary.

Gewirtz (1948b) investigated the influence of personality traits on word fluency. He used 15 of the Fels Child Behaviour Scales designed to measure such factors as aggressiveness, cheerfulness, etc. Children were rated by their teachers on these scales. In spite of the known low reliability of such ratings, the correlations between the ratings and word fluency tests tended to be positive and ranged from .00 to .58. Forty-one out of 154 correlations were significant at the 5 per cent. level or better, indicating that word fluency ability may be a function of temperamental as well as intellectual traits.

Two other studies relating to personality do not fit any special category but may have some bearing on the question. Crown (1952a) used a Word Connection list in which subjects underline one of two responses to a stimulus word (e.g. baby—foundling, little). One response is “normal”, one “abnormal”. Using over 3,000 cases, he showed that there were significant differences between normals, neurotics and psychotics. Furthermore, “normal” samples showed considerable variability in mean scores. Davis (1937), in a study of 21,800 remarks obtained from 436 children aged 5.5 to 9.5 years, found that there was a strong tendency to avoid words with an unpleasant connotation. The ratio of occurrence was 1,057 to 80.

We may conclude that personality factors may play an important role in determining an individual's vocabulary level in relation to his other abilities—a conclusion of special importance in the present context where it is assumed that prior to deterioration, vocabulary level is the same as level in other abilities.

(g) *Length of Institutionalization*

There is evidence that length of institutionalization may exercise a significant influence on Vocabulary level. Thus Capps (1939) found a correlation of $-.35$ between length of institutionalization and deterioration of vocabulary in his epileptic subjects although there was no correlation with length of disease. Rabin *et al.* (1955) found no difference between recently hospitalized schizophrenics and normals, but a very significant difference between long-term schizophrenics on the one hand and short-term schizophrenics and normals on the other, the groups being matched for age and education. Moran *et al.* (1952a), on the other hand, also testing schizophrenics concluded that “length of commitment, when considered in relation to education, seems to have no measureable association with mean W-B raw score”. The discrepancy is more apparent than real, however, at least for male subjects. Moran *et al.* (1952a) obtained a mean of 20.1 for their male schizophrenics hospitalized $\frac{1}{2}$ –1½ years; which dropped steeply to an average of 15.6 for those hospitalized 2–15 years (there being little change within this period). Rabin *et al.* (1955) obtained a mean of 24.62 for their short-term schizophrenics hospitalized 5–22 months (mean 11.5 months); and a mean of 14.90 for their long-term schizophrenics hospitalized 32–59 months (mean 46.2 months). It is clear that the two groups of male schizophrenics are reasonably comparable and there appears to be a clear relationship between vocabulary score and length of hospitalization for male schizophrenics. Nelson (1953) confirmed these results using acute and

chronic schizophrenics. The former had been hospitalized on average 9 months; the latter 9 years. The acute schizophrenics had a mean vocabulary score significantly higher than the chronic. Nelson, however, also found that vocabulary correlated significantly and negatively with degree (severity) of illness to an even higher degree than with length of illness.

Fox and Birren (1949) in a study of 216 resident old people in a city home for the aged found a correlation of .01 between age and Wechsler Vocabulary and .06 with Seashore Vocabulary Test, indicating that Vocabulary does not decline in normal people even when institutionalized for periods of up to 20 years. But these results, of course, do not invalidate the conclusions arrived at above.

(h) *Degree of Co-operation*

Although patients obviously differ in the degree to which they are willing to co-operate in the testing situation, few authors have attempted quantitative measurement of this variable. Rapaport (1951, 1953) in two studies with schizophrenics and organics, used the Elgin Test Reaction Scale (TRS) as an index of co-operation. He found correlations between TRS and Vocabulary score of +.89 (schizophrenics) and +.72 (organics), the correlations remaining high even when he split his patients into very and poorly co-operative groups.

7. CHANGES IN VOCABULARY (CONVENTIONALLY SCORED) IN MENTALLY ILL PATIENTS

We have seen that Vocabulary level may be influenced by a large number of factors. Such factors have frequently been left uncontrolled in the various studies carried out on Vocabulary level. Nevertheless, even such poorly controlled studies have often revealed changes in Vocabulary occurring in the presence of mental illness and while such studies cannot be considered conclusive in any sense, they will be reviewed with this caution in mind. In this section only those results relating to the conventionally scored Vocabulary tests (i.e. recall tests of the Wechsler and Binet type) will be referred to.

Malmo (1948) tested 9 patients on the Binet Vocabulary before and after lobotomy or gyrectomy. All six lobotomy patients showed a reduction in Vocabulary, the group mean difference being significant at the 2 per cent. level. A general mean tendency towards concreteness of definitions was found.

In Capps's (1939) study, the Binet Vocabulary showed progressive decline from mildly to severely deteriorated epileptics.

Rappaport (1953) divided 85 schizophrenics and organics into three levels of behavioural accessibility, using the Elgin Test Reaction Scale. He found that in the schizophrenic group, scores on both Binet and Wechsler Vocabulary declined significantly at each of the three levels. For the organic group, the Binet similarly declined at each level, but the Wechsler much less so.

Rabin, King and Ehrmann (1955) using three groups of 25 long-term schizophrenics, 25 short-term schizophrenics and 25 hospitalized normals, matched for age and education, found no difference between the short-term schizophrenics and normals on Wechsler Vocabulary but the long-term schizophrenics were significantly poorer than either the normals or the short-term schizophrenics.

Moran, Moran and Blake (1952a) compared 40 male and 33 female matched pairs of schizophrenics and normals on Wechsler Vocabulary. Both male and female schizophrenics scored significantly lower than the normal controls.

Nelson (1953) used groups of female normals, psychotics, organics and neurotics, carefully matched on many variables, age, I.Q. level, socio-economic status, etc. The normals (32·30) were significantly better on the Binet Vocabulary test than the psychotics (28·13), organics (23·31), and neurotics (27·70); while the psychotics and neurotics were significantly better than the organics.

A few studies show no change in Vocabulary. Thus Canter (1951) found that the mean Wechsler Vocabulary score of 47 multiple sclerotics changed from 11·02 to 10·95 over a period of six months, the difference being insignificant. Ström-Olsen *et al.* (1943) presented data on the S-B Vocabulary performance of 11 chronic patients before, 6 weeks after, and 4 months after leucotomy. The results were statistically analysed by Crown (1951) and showed no change after the operation.

Markwell *et al.* (1953) tested 17 schizophrenics before and 4 months after lobotomy and found no change in vocabulary score.

Allen (1947) tested 50 brain-injured patients and found that their mean vocabulary score of 10·2 was significantly different from the means for Digit Span (6·68), Object Assembly (7·6), Block Design (7·9) and Digit Symbol (6·86). Waldfogel and Guy (1951) found that manic-depressive patients (some in a manic state, some depressed) showed large negative vocabulary scatter, Vocabulary mean being more than 2 points higher than any Performance Scale subtest mean. But he also showed that this scatter was in part a function of age. Garfield and Fey (1948) found no difference between 67 schizophrenics and 48 non-psychotic control patients on vocabulary score (the schizophrenic patients were, however, all young acute cases). Following temporal lobectomy for psychomotor epilepsy, Meyer and Yates (1955) found only a slight change in vocabulary score on the Wechsler but also found that such patients had great difficulty in learning the meaning of new words. Botwinick and Birren (1951b) found no difference between normal and abnormal aged subjects. Roth and Hopkins (1953) and Hopkins and Roth (1953) present data on groups of affective psychotics, paraphrenics, acute confusional states, arteriosclerotics, and senile psychotics, all old people over 70 years of age. Only the senile psychotics showed a decline in vocabulary, being significantly differentiated from all the other groups except the arteriosclerotics. The other groups did not differ.

The only unequivocal conclusion to be drawn from the results of these studies is that, even when the tests are conventionally scored, some studies have indicated severe changes in Vocabulary in mental illness. It seems very unlikely, for instance, that the striking differences reported by Rabin *et al.* (1955) and by Moran *et al.* (1952a) could be accounted for in terms of the scoring technique. On the other hand, where differences are minimal, the scoring technique becomes very important, making it difficult to evaluate such studies.

8. CHANGES IN VOCABULARY (MORE RIGOROUSLY SCORED)

Many studies have been carried out on the changes in vocabulary which take place in mental illness, making use of the more objective type of vocabulary test. Some of these studies attain a high standard of experimental and statistical sophistication.

Greater objectification of a vocabulary test may be obtained in three ways.

(1) Finer scoring categories may be constructed within the framework of the conventional methods. The difficulties of doing this are obvious. For example, if it is difficult to score the Wechsler Vocabulary subtest (with its

threefold classification—0, $\frac{1}{2}$, 1) reliably, it will be even more difficult to obtain reliable scoring if the number of scoring categories is increased—however desirable this may be in theory. However, the attempt was made by Webb and Haner (1949). They took 286 correct definitions to the words of the Wechsler vocabulary. They found that the number of “acceptable” definitions for each word varied widely, from 32 for “seclude” to 5 for “mantis”. These correct responses were then rated on an 11-point scale ranging from “acceptable” to “non-acceptable” by 40 psychology students. The agreement between ratings was measured in a number of ways, including the reliability with which an individual rated the same word twice (using the not very impressive method of repeating some words twice at wide intervals and hoping that the rater would not notice this fact) and the reliability with which two groups rated the same word. They also measured the extent to which the same word could fall at both ends of the continuum. They found that an individual would rate words reliably but that on an 11-point scale the agreement on the rating of words was quite low. They also found low agreement on the acceptability or non-acceptability of words. Thus, in one instance, 13 subjects rated a word “acceptable” while 7 rated it as “non-acceptable”.

This is the only study of its kind discovered by the author. Webb and Haner, of course, probably used a rating scale with too many points on it (a 5- or 7-point scale would have been better) but their results certainly suggest that the methods to be described below are preferable to an extension of the Binet or Wechsler type of test.

(2) An alternative method is to score the vocabulary test in another way. This has usually involved only the use of words whose meaning is “reliably” correctly defined. These words are then placed by different psychologists into qualitatively separate compartments. If the placements are reliable (and reliability coefficients reported seem to be uniformly high), different groups may be compared with respect to the type of definitions which they use and the influence of various factors calculated.

Gerstein (1949) proposed three levels of definition:

- (a) *Concretistic or descriptive*—the most primitive level of verbal definition, involving memory of the object at a concrete level, e.g. “apple”—an apple is red.
- (b) *Functional or usage*, e.g. “apple”—something you eat.
- (c) *Categorical or conceptual*, involving the abstract attitude, e.g. “apple”—a fruit.

Gerstein derived these three levels from the results of developmental studies of thinking by Reichard, Schneider and Rapaport (1944). The descriptive level is said by them to be dominant up to the age of 8, the functional from 8–9 and the conceptual from 11 years upward, though there is, of course, considerable overlap.

Gerstein did not provide any experimental evidence on the usefulness or otherwise of these classifications but two studies by Stacey and Portnoy (1950, 1951) applied her method. In the first (1950), they compared two groups of children, one a group of defectives, one a group of borderline intelligence, on the proportion of vocabulary responses falling into each of Gerstein’s three categories. While both groups used predominantly the functional type of response, the defective group used significantly *fewer* descriptive and significantly *more* functional types of definition than did the borderline. This finding was contrary to expectation, since descriptive responses were hypothesized to be

characteristic of low intelligence and functional responses to represent a higher level. In their second study (1951), Stacey and Portnoy found that there were no differences in the proportions of descriptive, functional and categorical responses for three adult groups—dull-normal, borderline, and moron; the groups being matched for age. Again the results were contrary to prediction. Surprisingly, they also found that adult morons and borderline cases used significantly more descriptive, and significantly less functional, responses than did child morons and borderline cases; though they used significantly more categorical responses. In another study, Stacey and Spanier (1954) used the same technique with three levels of intelligence among college students. They found that all three groups gave proportional responses in the order, abstract, descriptive, functional.

Again, Gerstein's hypothesis was not supported except that the most intelligent students gave significantly more abstract responses than either of the other groups.

These results throw some doubt on the validity of Gerstein's triple classification. This may possibly be because the classification proposed by Gerstein was too narrow. Most authors have used four or five categories, as we shall see.

Feifel (1949), in his important monograph, used a 5-fold classification for words of the Binet L Vocabulary test:

- (a) Synonym.
- (b) Use; description; and use and description.
- (c) Explanation.
- (d) Illustration; inferior explanation; repetition; demonstration.
- (e) Error. This includes incorrect demonstration; misinterpretation; wrong definitions; slang associations, etc.

Most of these categories, were subdivided still further. Nevertheless, the reliability of scoring by an independent examiner ranged from 96–100 per cent.

For subjects, he used 185 normal and 185 abnormal subjects. The principal comparisons were made on two groups of 135 subjects, matched for age, education and vocabulary scores. They were divided into 3 age levels: 15–29 ($n=38$); 30–49 ($n=56$); and 50–79 ($n=41$). A supplementary study was made on 50 matched pairs, where education was not controlled.

In this very carefully controlled experiment Feifel obtained strikingly consistent results. Comparing normals with abnormals, he found that at all age levels, the normals used significantly more synonyms; while at all age levels, the abnormals used significantly more use and description, explanation and demonstration categories. Comparing different age groups, he found that in normal subjects, no marked changes were detectable. In abnormals, on the other hand, he found that young abnormals tended to prefer the synonym type of response while old abnormals tended to prefer the poorer types; but that these differences were not very marked.

In an auxiliary study, Feifel found very similar results, using only the first 10 words of the Binet, i.e. words correctly defined by all subjects.

Moran, Moran and Blake (1952b) used categories very similar to those of Feifel:

- (a) Synonym.
- (b) Use and description.
- (c) Explanation.
- (d) Inferior.
- (e) Error.

They used 32 matched male pairs and 31 matched female pairs of normals and schizophrenics and compared them on the Wechsler vocabulary. The groups were matched for sex, age, education level and vocabulary raw score. They concluded that "a comparison of scores of the schizophrenics with those of the normals at various age, educational and raw score levels revealed that the conceptual level of the definitions given by the schizophrenics was not essentially different from that of the normals with whom they were matched".

Thus, paradoxically, by comparison with most other studies, Moran *et al.* found that while schizophrenics obtained a lower Vocabulary raw score compared with matched normal controls, the actual quality of their correct definitions was in no way different from that of normals. These results conflict clearly with those obtained by Feifel, using the same classification technique.

The explanation of the difference in the results put forward by Moran *et al.* is that while their own study included only schizophrenics, Feifel included depressives and organics in addition to schizophrenics. The poorer quality definitions given by Feifel's abnormal group as a whole would, they suggested, be due to the inclusion of the depressives and organics, the schizophrenics not differing from the normals in this respect. That this explanation is probably incorrect was shown by Harrington and Ehrmann (1954) who found schizophrenics significantly poorer than a matched control group in the verbal definition type of response (where the response was rated using Gerstein's classification system).

Moran, Moran and Blake (1952c) found however that experienced examiners could pick out schizophrenic vocabulary responses on a blind analysis with better than chance success, apparently by making use of cues contained in the responses. Furthermore, the percentage of correct identifications appeared to increase very markedly with increased clinical experience. However, many normals were misclassified by this method, as would be expected from the results obtained by qualitative analysis.

(3) The third method of objectifying vocabulary tests is to use tests of the multiple-choice recognition kind, in which the response-choices are specified by the examiner. This method has the advantage of complete (or almost complete) objectivity and reliability, which compensate for the disadvantages.

Chodorkoff and Mussen (1952) used Feifel's method. For each stimulus word, class, description, example and function definitions were constructed and the subject asked to underline the "best" definition, e.g. the word "ball" may be defined at four levels:

- (a) class—athletic equipment.
- (b) description—round and made of rubber.
- (c) example—a baseball.
- (d) function—to play with.

They used 86 words from Thorndike's Word List. Their subjects were 40 schizophrenics and 40 normals matched for vocabulary on the Shipley-Hartford and for age and education. They found that while the order of preference was the same in both groups (class, description, function, example) the schizophrenics underlined significantly fewer class responses and significantly more function and example responses than did the normals, the differences being significant at the 1 per cent. level. These results were not substantiated by Harrington and Ehrmann (1954), who found no difference between matched schizophrenics and normals.

Capps (1939) used both group and individual vocabulary tests. The group

multiple choice included synonyms, antonyms, categorization and sentence usage tests; the individual tests included word naming and a homograph test. He tested 80 idiopathic institutionalized epileptics and 20 control subjects from the same environment. He also controlled many factors (intelligence level, education, reading ability, age, sex, abnormalities) and divided his subjects into three classes of deterioration. His results showed that "all of the vocabulary tests, individual and as a group, show quite consistent, progressive and reliable decline in scoring associated with an increase in the degrees of mental deterioration. The mildly deteriorated group shows a reliably inferior score in each test when compared to the least deteriorated; and a reliably superior score in each test when compared to the most deteriorated group." The correlations of the various Vocabulary tests with estimates of deterioration were all high, ranging from .84 to .65.

Ackelsberg (1944) repeated Capps study on a group of 50 senile dement (60-81), divided into three categories of deterioration, as in Capps study. She found that the synonym and antonym tests reliably discriminated in all three comparisons, while the categorization and homograph tests were somewhat less sensitive. She concluded that the general level of vocabulary functioning shows a positive relationship to estimated levels of mental deterioration in senility and that none of the vocabulary tests used could satisfactorily serve as an indicator of previous mental ability.

Malmo (1948) found that 9 patients tested before and after lobotomy or gyrectomy showed a mean significant deterioration on Capps's Homograph test following the operation. His data are not very satisfactorily presented, however. Zubin and Windle (1951) report a rather curious result, using Capps's Homograph test. Comparing patients subjected to psychosurgery with similar patients not treated in this way, they found that *good* performance pre-operatively apparently related to *poor* prognosis following the operation.

Two studies by Crown produced somewhat conflicting results. In the first (1952b), he studied 36 patients (all psychotics) before, and three months after, lobotomy. He found a highly significant decrease in score on the Mill Hill Vocabulary Scale (the mean I.Q. dropping from 102 to 97.1). In a subsequent study (1953) he tested 7 patients (3 obsessives; 4 depressives) before and after operation (leucotomy in 3 cases; topectomy in 3; cortical undercutting in 1) and found no change in score on the Mill Hill Vocabulary (although a test of "creative opposites" showed decline). However, the number of subjects in this experiment is so small in relation to the varied methods of operation that no conclusions can be drawn and the earlier study is probably the more reliable.

Another study by Crown (1949) is of a quite different nature and important in spite of the relatively small numbers involved. He tested 4 patients suffering from myxoedema on the Matrices, Mill Hill, and Shipley-Hartford, before and three months after treatment. Myxoedematous patients show marked but temporary deterioration which can be reversed by suitable treatment. Clearly, if the patients improved in vocabulary after treatment, then a direct indication that vocabulary can be affected by mental illness would be afforded. Crown's results should be treated cautiously as so few patients were involved, but his results indicate that both intelligence and vocabulary may rise to a significant extent as a result of treatment.

9. DISCUSSION

It is clear that the results presented above require no detailed discussion, since in general they speak for themselves. Many of the experiments are so

poorly controlled (in this respect, resembling the tests of brain-damage discussed in a previous paper (Yates, 1954)) that no valid conclusions can be drawn from them. The different results presented by the various authors dealing with much the same problems may be an artefact of the different experimental conditions, and samples employed. Or they may be due to more fundamental difficulties concerned with the reliability and validity of the tests used.

This latter point is one which has been consistently ignored by most authors when considering the clinical use of a vocabulary—non-vocabulary discrepancy as an index of deterioration. It will be useful to consider this point in some detail. It will be remembered that the third and fourth points of the rationale discussed at the beginning of this paper stated that Vocabulary is highly correlated with other estimates of “g” level, and may therefore be used as a measure of previous level of intelligence. Clearly, the validity of this claim is crucial. If the claim is an invalid one, then the method must be abandoned on practical grounds, however sound the theoretical aspect may be. Three important points may be made in this connection:

(1) The use of vocabulary as a measure of previous level of intelligence is subject to a very large amount of error. It has already been shown that the prediction of I.Q. on a verbal type intelligence test from a knowledge of vocabulary score is subject to a considerable degree of error in individual cases and that this degree of error is even greater when the intelligence test is a non-verbal or “g” test. The error may be as much as 20 points on either side of the best predicted mean score.

(2) However, when estimating a subject's previous level of intelligence, the estimate being made is not even the most accurate that could be made (i.e. on to a verbal-type intelligence test, since verbal abilities are supposed not to decline) but on to a performance or “g” type intelligence test, since we wish to compare previous non-verbal level with present non-verbal level. In the case of “g” tests such as the Matrices, the accuracy of the prediction is very poor indeed, since the correlation between Matrices I.Q. and the Wechsler Vocabulary for example is very low.

(3) Furthermore, in addition to the large amount of error involved in predicting previous level of intelligence from vocabulary score, we must also consider the reliability of the estimates of present level of non-verbal functioning. In this connection, Hamister (1949) has provided data which are startling in their implications. After calculating the test-retest reliabilities of the various subtests of the Wechsler, he concluded that “the range within which true scores can be expected to lie is quite large relative to the total possible range in score for some subtests. For Information, this range ($\pm 2 SE_m$) is 3.2 WS points, while for Digit Span it is 8.8 WS points. For seven of the subtests, this range is equal to or greater than 6 WS points, one-third or more of the total possible variation for any subtest.” He adds that “for all except 4 subtests then, deviations up to and including the standard 3 WS points above and below the mean WS could easily be a function of errors of measurement”.

If therefore, Vocabulary is subject to a wide degree of error in predicting previous level of intelligence and especially so when the prediction is made on to a non-verbal level (as in clinical work) and if the estimated present non-verbal level is also subject to considerable error it seems clear that for all practical purposes vocabulary is virtually useless for the aim of detecting whether or not deterioration exists in individual cases. For the discrepancy to be abnormally large, the difference must be so great that a statistical estimate is superfluous and, perhaps indeed, even the necessity for administering any tests.

To these hazards we must add the further one that the discrepancy between vocabulary score and non-verbal test score is profoundly influenced by age. Considering the possible range of scores on the Wechsler subtests, and making due allowances for decline in performance (on the non-verbal tests) due to age, it would seem that it is practically impossible to obtain an abnormally large difference between vocabulary and non-vocabulary scores unless the patient obtains either a gigantic vocabulary score, or a zero score on the performance tests, or both.

From the purely practical, clinical point of view, therefore, it would seem that these considerations preclude the use of vocabulary in this way, unless the reliability of the non-vocabulary tests can be very markedly improved, or alternatively some non-verbal "g" test be found whose pre-deterioration correlation with vocabulary is very high.

From the wider, research point of view, several interesting results emerge from the above review.

(1) In the first place, it seems clear that vocabulary does decline in patients suffering from brain-damage. This loss includes both a decline in the quality of responses and an absolute decline in terms of the number of words whose meaning is known.

(2) Secondly, vocabulary would appear to decline, both in quality and quantity in institutionalized epileptic patients.

(3) Thirdly, it would seem that vocabulary level may decline in schizophrenic patients. It would also seem that the quality of schizophrenic responses changes significantly. While the results obtained by Moran *et al.* (1952b) were in disagreement with those of Feifel (1949) and suggested no qualitative decline, a later, very careful study by Moran (1953) did find such a decline. Moran attributed his previous failure to find such a decline to inadequate technique in his previous experiments—a refreshing modesty in a field where dogmatic statements are all too common.

(4) Fourthly, it would seem that, while neurotics as a group do not decline on vocabulary score, different types of neurotics have different sizes of vocabulary in relation to their other abilities.

(5) Fifthly, the above results show clearly that vocabulary, far from being a very stable ability, is very significantly influenced by a large number of factors.

(6) Sixthly, there is some evidence to indicate that a potent (perhaps the most important) factor in inducing a decline in vocabulary is the length of time a patient is institutionalized. This would explain why neurotics show little or no decline since they tend to be treated on an out-patient rather than an in-patient basis.

The vocabulary test is therefore one which has proved extremely fruitful in clinical research work. The author would like to close by pointing out that much of this work has been vitiated by very poor experimental control or lack of a definite hypothesis to test. On the one hand we are confronted with the extremely careful work of Dunsdon and Roberts (1953, 1955), for example, carried out on a large, carefully chosen sample and subjected to refined statistical treatment; work which is, however, carried out on a purely empirical basis, and loses much of its value thereby. On the other hand, we are presented with the highly original hypothesis of Babcock, designed to circumvent a definite clinical, practical obstacle (the absence of test-retest data on a given patient); a hypothesis whose testing however, was carried out with an extraordinary lack of control. Several studies which have not so far been mentioned combine the virtues of both of these approaches and merit brief special mention.

One of these studies makes use of an original hypothesis. Glik (1951) experimented on the known fact that recognition vocabulary tends to be better than recall vocabulary in normal persons. If recall vocabulary in fact declines in abnormal persons, then it follows that recall/recognition differences will be significantly greater in abnormals than in normals. He compared non-deteriorated neurotics in two age groups (below 45, and over 45), controlling for differences in intelligence. He used the Wechsler Vocabulary in recall and recognition form, the differences being expressed as a percentage. He found highly significant differences between young deteriorated and young non-deteriorated subjects; no such differences for the old normals and abnormals; and no difference between the young and old deteriorated subjects.

Two other studies, are critical investigations of Babcock's thesis, but both are highly original in conception. Cohen (1952a, 1952b) factor-analysed the Wechsler-Bellevue and found three factors which he named verbal, non-verbal, and distractibility. These factors correlated to produce a general factor, which he named present intellectual functioning. He also found that the vocabulary test is the best measure of the verbal factor in his schizophrenic and neurotic groups, but almost the poorest measure of it in his organic group. As a measure of present intellectual functioning, it is the best measure of it for the neurotics, ranks 6th out of 12 for the schizophrenics and last out of 12 for the organics. In the organics therefore vocabulary is the poorest measure of both present level and of verbal ability (representing past ability), i.e. vocabulary declines very markedly. In the neurotics it is the best measure of present level and verbal level. In the schizophrenics it is a poor measure of present level but a good measure of past level. Thus, support for Babcock's hypothesis is presented by means of factorial analysis in a quite original and ingenious manner. It also indicated that vocabulary deteriorates more in organics than in schizophrenics.

The second study of this kind is that carried out by Shapiro and Nelson (1955). This study is too long and complex to be summarized adequately here. Briefly, however, they showed that close study of Babcock's original work revealed that she tried to measure three aspects of deterioration at the same time, namely, (1) the discrepancy between present level and past level of cognitive functioning; (2) the discrepancy between present speed and present level of functioning; and (3) the discrepancy between present learning and past learning. For these purposes, vocabulary is used in turn to perform three different functions—as a measure of past level, present level and past learning. In turn, each of these three uses is subjected to critical analysis by Shapiro and Nelson (on both theoretical and experimental grounds) and the fundamental confusion in Babcock's work revealed. The authors then proceed, however, to deduce ways of testing Babcock's hypotheses by means of appropriate tests and to investigate how the results change when different factors are allowed to vary. While the mass of interesting results cannot possibly be summarized here, the investigation stands as a model of precise investigation and controlled experimentation.

These four studies, together with a few other recent ones (e.g. Moran *et al.*, 1952a, b, and c; Feifel, 1949) contrast strikingly with much of the work carried out earlier on this problem of changes in vocabulary in mental illness. The tardy appreciation of precise experimental method and adequate statistical treatment of data, coupled with the use of hypotheses concerning the results to be expected based on a rational theory, encourage the hope that a reliable body of information which will enable definite conclusions to be drawn on this subject may soon

be available. It is a depressing commentary on the state of clinical psychology that this is the best conclusion that can be arrived at after 25 years of research.

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MENTAL MALADJUSTMENT IN THE EAST AFRICAN

By

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INTRODUCTION

RELATIVELY little is yet known of the incidence or nature of mental disorder in Africans. The literature on African psychiatry is not extensive and, although a wealth of anthropological and sociological work has given us an idea of the cultural and physical background of the African, we are still much in the dark as to how these factors influence his personality and what bearing they may have upon mental illness. A number of studies of patients in African Mental Hospitals have been made by various writers and diagnostic classifications have been attempted. Most writers agree that it is rare to find any great degree of similarity between the various types of mental disorder in Africa and those found in the higher developed western countries. Most of the work in this field has been summarized by Carothers (1954).

My aim in this paper is to give a rough idea of the African background, to speculate on various aspects of the African personality in the light of present knowledge, and to try and reflect these speculations by description of the various types of insanity that are encountered in a mental hospital in Tanganyika. Some of the differences in the nature and aetiology of these disorders, compared with those most common in the home country, will be discussed. My remarks are, of course, confined to Tanganyika and if I inadvertently use the term "the African" I refer to the native of Tanganyika whom I have studied for the past eight years and who compose the bulk of the patients in hospital.

BACKGROUND

The African in Tanganyika has not developed to the same extent as his brethren in Kenya and Uganda. The predominant race is the Bantu, but in the north and north-west there is some Nilotic and Hamitic influence. The Territory is one of the few remaining areas in Africa containing tribes which are almost unknown and it also contains the widest variety of physical and language groups to be found in any one part of Africa. There are 120 tribes in Tanganyika, speaking, in most cases, entirely different languages.

With so many tribes at widely different stages of development, it is almost impossible to generalize on their cultural background. Nevertheless a few factors do seem to remain constant, and from studies by Tooth (1950), they seem to apply to West as well as East Africa.

Carothers (1951) points out the rigid social organization, based on the family system, which is almost universal in Africa. This system demands meticulous observation of certain rules which are inculcated into the individual, not only by parents, but by everyone in the group from infancy onwards. In such a social organization the one desire of a member of the group is to become exactly like the rest. The African thus becomes protected from infancy and is never in a position when he does not know how to behave or what to do.

Everyone in the group sooner or later knows the whole culture of the group and there is a great equality of knowledge with little specialization. In the sociological sense, different "life styles" do not exist within an African community. For these reasons social distinctions practically do not exist. Age is the only thing that demands reverence and respect. Words like ambition and progress do not enter into the bush African's vocabulary. The only reason he works is to obtain food.

In tribal life primary interests are food and health. There are few sexual taboos and heterosexual relations begin early. Masturbation is accepted as normal up to the age of puberty but ridiculed after maturity. The same deterrent is applied to homosexuality. Romantic love as we know it does not exist. The African affords his wife a certain amount of protection but she is looked upon mainly as a vehicle for bearing children and for providing food. Before marriage the husband often demands that his prospective wife should bear a child to prove her fertility—and the child need not necessarily be his own. After marriage fidelity is demanded by custom. Adultery is a serious crime and, as the husband pays a bride price for his wife, is looked upon as a form of stealing but love and loyalty do not enter into it. Following a hysterectomy, for example, the wife may be sent home to her relatives as of no further value.

The influence of superstition on African culture is considerable. Anything that happens in the African's life that cannot be dealt with by the fixed rules he has been taught and understands, he puts down to the working of superior, and therefore, magical forces. The African never seems to ask "why", but endows everything that is beyond his ken with a supernatural explanation. An aeroplane, to the African in the bush, is just another bird made a bit different by magical forces. He does not pause to consider why it makes a noise or does not move its wings. As Carothers (1951) succinctly remarks, "magic and animism take the place of logic, speculation, and the search for true causes".

From infancy to the grave the African's life is crowded with superstitious customs and ritual. Ceremonies like tribal initiation, which are almost universal, leave an indelible impression. These rites, symbolic of death and rebirth, instil in the mind of the initiate all the tribal folk-lore traditions, magical beliefs and practices that have been handed down from generation to generation. These superstitious beliefs become so ingrained that it is not uncommon to find even an educated African resorting to his tribal beliefs in moments of stress or illness. Insanity is often believed to be caused by witchcraft, and sometimes the patient himself is regarded as an exponent of the black arts.

Physical factors play more than an important part in the African background, and the problems of malnutrition are being increasingly recognized as fundamental in African psychiatry. Malnutrition and infectious disease are so rife that the average African in Tanganyika is probably both undernourished and infected with more than one type of parasite which, as Carothers (1954) points out, is also the position in much of the rest of Africa.

Briefly then, the average rural native of Tanganyika is at a cultural level little further advanced than the family system and almost completely illiterate. He is protected from infancy by group unity and uniformity of custom. His life is simple and uncomplicated and without sexual inhibitions. He is filled with superstitious beliefs and his thinking is animistic, concrete, and often illogical. Generally he appears unintelligent, emotionally unstable, and essentially lazy, but this may be associated, to some extent, with the prevalence of malnutrition and the high incidence of infectious disease which may have an adverse effect on his mental development.

SOME SPECULATIONS ON AFRICAN PERSONALITY

It is over eighty years since Winwood Reade (1872) wrote, "A people can never rise from low estate as long as they are engrossed in the painful struggle for daily bread. On the other hand, leisure alone is not sufficient to effect the self promotion of man. The savage in the primeval forest burns down a few trees every year, his women raise an easy crop from the ashes which mingle with the soil. He basks all day in the sunshine or prostrates himself in his canoe with his arms behind his head and a fishing line tied to his big toe. His life is one torpor, with spasms of activity. Century follows century but still he does not change."

Change leading to progress may be the natural and logical consequence of want, for in times of want, a race to survive, must either make the land more productive or invent and manufacture goods that can be exchanged to provide the essentials of life. Also, the constructive response of a society to special challenges, such as disease or famine, may result in a better standard of living. Again, a society may progress because of fortuitous contact with more advanced cultures—for example, the Roman influence on Britain. These factors, however, seem to have had little effect on the progress of the rural African towards a higher state of civilization.

During an estimated 10,000 years the rural African has remained almost unchanged. The land has always provided the bare necessities and he has not needed to resort to invention. Although, in times of famine and pestilence millions have perished, the race has survived because of the nomadic customs of the people who, when the land became impoverished in one place, moved to another. On the other hand the people who now inhabit the western world were driven to inventiveness in order to survive. This inventiveness led to pride in achievement, and urge to investigate and a desire to improve, which has taken on a driving force of its own; a drive towards further progress, even when the element of want has, generally, ceased to exist. The African seems to have failed to develop this autonomous drive, and this may be one of the reasons why he appears so different from the people of the western world, and why we find his mentality so difficult to understand.

In the social organization found in Africa, the main desire of one member of the group is to become exactly like the rest. This being so, theoretically, the personality of one African should be much like the next. Amongst a group of normal Europeans we would find a number who could be described as introvert or extravert, schizothyme or cyclothyme, or fitted somewhere into the picture as a personality type. In a group of normal Africans this does not seem possible—the schizothymic temperament is as rare as the cyclothymic. The African's physique also shows little variation. There are differences in stature between various tribes but the types of physique described by Kretschmer (1936) are not often found in Africa. Amongst patients in hospital a pyknic African seems hardly to exist and the true leptosomatic physique is equally rare, though malnutrition sometimes gives an asthenic appearance. Generally, both the personality and physique of the African in Tanganyika seem to show less variation from the "norm" than the European.

As in Europe, the difficulty arises of what exactly is the "norm". Carothers (1951) believes normal African mentality (in Kenya) closely resembles the section of the European population which is commonly entitled psychopathic or sociopathic. He found three striking characteristics in the African personality. The first was a failure to see an event in a total situation, and as having a variety of relevant relationships; the second, a continued tendency to follow routine

procedures in an unreasoning fashion; and the third, a lack of interest and attention unless the situation appeals in a directly personal and emotional fashion. Carothers pointed out that the African's behaviour is largely determined by his passing emotions and that he lacked foresight, perseverance and sustained determination.

Carothers, in the same paper, went on to compare the African's lack of judgment and faulty synthesis to that of a leucotomized European. "The prevailing mood is one of cheerful self-satisfaction, and emotions are more directly egotistical and transitory and little felt in more altruistic and abstract situations. Interest in the environment is more varied and variable, wider but more superficial, and concerned with its more immediately utilitarian aspects. There is a lack of self-criticism and self-consciousness (social and probably personal) and a lack of sympathy for the feelings of others. There is an inability to envisage, or lack of interest in, the future implications of a course of action, a lack of regret for past actions, and a tendency to live more in the present. There is a lack of sense of right and wrong in any general sense, though a conventional religiousness is common. There is difficulty in synthesizing or in remembering more than one detail at a time, a lessened distractibility, a loss of creative activity due to an inability or urge to reintegrate images, and a preference for stereotyped routines."

There is no doubt this summary of the changes which may follow leucotomy presents a graphic picture of the East African native, and one with which most people who have had experience with Africans would agree. Emotionally determined behaviour cannot account for all the African's failings pointed out by Carothers for more advanced societies are not without limitations in this respect. It is difficult to deny the similarity of the bush Africans' mentality to frontal lobe defect syndrome, or the "frontal lobe idleness" postulated by Carothers. Many Africans tend to be apathetic and lack interest in everything except their immediate environment. Initiative is usually blunted and may be limited to finding enough to eat and a shady tree under which to rest. In his work with Europeans he is often found to be irresponsible and unreliable. Under the least mental or physical stress he shows a tendency towards uninhibited conduct.

The African seems, in some way, to be lacking the higher moral sense which is the heritage of more advanced civilizations. Tredgold (1947) traces the development of moral sense and suggests as man progressed through barbarianism to civilization, the emotions attached to the parental instinct crystallized into the sentiments and ideals of kindness, mercy, charity and benevolence in relation to conduct in general, and from the simple feelings associated with the gregarious instinct, there evolved the more complex emotions of self-esteem, satisfaction, submissiveness, shame and humiliation in regard to man's thoughts of his standing with his fellows, the totality of which emotions and ideals make up the sentiment of self-respect. Through the increased development of these emotions and sentiments, man was not only to know that certain actions were right and others wrong, but to experience emotions regarding such acts. In other words, man developed a moral sense or conscience.

It seems possible, owing mainly to his restricted pattern of culture, the African has not yet completely developed this moral sense, although tribal law and custom have exerted some influence on social conduct. The higher emotions and sentiments derived from the primitive parental and gregarious instincts may not yet have developed, or if they have developed, they have not fused to form the fully fledged moral sense described by Tredgold. If we can concede this

speculation, the failings in the African personality can be attributed to his not yet having developed a moral sense rather than that he is pathologically without the capacity of developing one.

From the psychobiological viewpoint lack of moral sense in the European is attributed to failure of super-ego development. Skottowe (1954) regards the super-ego as "an attitude arising from the unconscious (in the sense of un-deliberate) acceptance of standards of the cultural environment and their integration within the personality in the light of individual experiences and tendencies. It is not to be conceived as arising wholly from without. It seems necessary to recognize some kind of emotional intellectual organization by which the individual tends spontaneously to absorb the cultural inheritance of the social group in which he lives, and to strive towards higher forms of behaviour."

In the rural African, the super-ego, in the European sense, may have failed to develop. The standards of cultural environment which the African unconsciously accepts are quite different from anything European and his individual experiences and tendencies are integrated against a background of sympathetic magic instead of our complicated system of ethics with sexual and excretory prohibitions. He spontaneously absorbs the cultural inheritance of his social group which arises from within but, from its nature, there is little striving towards higher forms of behaviour. As the main desire of the African is to be exactly like the rest, as there are no complicated social or ethical standards which require obedience, and, as he is hardly ever in doubt about what is the right thing to do, he is unlikely to suffer from any sense of moral guilt. Such a cultural environment, together with a high incidence of infection and malnutrition, might possibly produce a race whose total, overall, personality would be psychopathic by European standards.

Advances in neurophysiology suggest that the diencephalic centres and the frontal lobes form an integrated functioning system and a lesion at any point in the circuit may produce symptoms of frontal lobe defect and lack of moral sense. Such a lesion may, apparently, result from certain organic diseases such as encephalitis lethargica or may be associated with a constitutional defect which occurs in a certain type of psychopath. On the other hand, it is possible that this defect might also be caused by failure of development of this system owing to adverse factors in the environment. Kennedy (1954) dealing with psychopathic personality and social responsibility, writes, "The case of Caspar Hauser drew our attention to the fact that an individual with a presumably normal nervous system, but with no human environment with which it can react, is as surely mentally defective as one with demonstrable brain anomalies. In the same way it can hardly be expected that a child brought up in an atmosphere of negative affective relations and complete absence of social responsibility will develop normally, even if the physical substrate exists. The difference between the two cases is that in the structurally normal there is always hope of bringing them to a socially compatible outlook through resocialization in a reasonably favourable environment, and this is in fact what we are doing with no little success in our Approved Schools and Borstals, so great is the natural tendency to recovery. When, however, we are hampered by defect which we have at present no way of making good, we cannot replace, but can only readjust."

The possibility of structural differences between African brains and those of Europeans has been mooted. Carothers (1951) voices a plea for expert anatomical study of the African brain and, in view of his resemblance to a

certain type of European psychopath, of the brains of the latter also. Vint (1934) showed there was no great variation in cortical cell counts in the brains of Africans and Europeans but that many of the cells of the African were immature cells. He thought the stage of cerebral development reached by the average native is that of the average European boy of between 7 and 8 years of age but went on to say it was impossible to know how many of the immature cells would mature under conditions of life and education different to those which normally obtain today. Gallais *et al.* (1951) found persistent theta rhythms in 78 out of 100 normal healthy Africans from the Guinea Coast but the value of these findings is doubtful. Mundy-Castle *et al.* (1953) found no gross differences in EEG characteristics between 66 normal African adults and 72 normal European adults.

These speculations have, so far, led us to two possible explanations, neither of which has been fully explored, to account for the anomalies in the African personality which have been described. Firstly, there is the possibility of actual structural differences in the brains of Africans—particularly in the diencephalic-frontal system—which may produce psychopathic tendencies. If these differences exist we have no way of making them good. Secondly, if there is no structural difference between African and European brains, it only needs re-education in a favourable environment to make good. If there are structural differences, more anatomical and neurophysiological study is required before any conclusion can be reached. If, on the other hand, there is no difference between the African brain and that of the European, we can only wait and see how the African responds to European education and culture. It is noteworthy in this respect that in countries such as the West Indies, where Africans have received a first-class education and first-class nutrition, and are no longer looked upon as peculiar because of this, the difference in their personality compared with Europeans is not so marked as in the undeveloped parts of East Africa.

MENTAL DISORDER IN TANGANYIKA

Incidence. Two hundred and fifty-two African mental patients, drawn from all parts of the Tanganyika Territory, were admitted to Mirembe Hospital, Dodoma, during 1954 and it is proposed to use these cases as a convenient group for discussion. Mirembe Hospital is the only hospital in Tanganyika Territory for the treatment of acute mental illness and has 450 beds. Over a thousand patients have been admitted during the past five years but this figure does not reflect the true incidence of mental disorder in Tanganyika for a number of reasons. The remoteness of some districts and difficulties in transport over great distances, may result in some patients never reaching hospital. The feeble-minded African is more likely to be tolerated the further away he is from hospital, and this may also apply to the true psychotic. Much depends on the psychological awareness of the administrative officers of the district and on the people themselves. Also, a psychiatrically minded Medical Officer is likely to send more patients to hospital than one who is not so inclined. Various taboos regarding insanity exist amongst some backward tribes, and these tribes are likely to provide relatively fewer patients than the more advanced. For these reasons it is not possible to present anything approaching a representative sample of mental disorder as it occurs in Tanganyika. The 252 admissions make a convenient group but can only give some idea of the general trend and no more.

TABLE I

Population Figures from 1948 Census

Province and Average Distance from Dodoma in Miles	Total No. of Patients Admitted 1954	Population	Percentage of Population who have ever Attended School	Government and Mission Hospitals (73 having European M.O.)	Government and Mission Dispensaries
Western (150)	58	936,798	7	18	52
Central (—)	47	815,345	4	13	64
Lake (450)	32	1,826,022	8	19	106
Eastern (250)	29	899,607	5	13	87
Tanga (280)	26	546,292	23	14	48
Northern (300)	23	578,919	8	10	56
Southern Highlands (330)	21	844,877	10	15	59
Southern (400)	16	884,679	11	32	38
			Average		
	252	7,335,291	9	134	510

Table I gives the number of patients who were admitted to hospital from each of the eight Provinces of Tanganyika during 1954. It will be observed that the number of patients admitted from each Province is not in the same proportion to the population figure of each Province in every case. This is due to the variable factors that have already been mentioned. The percentage of the population who have ever attended school and the medical facilities in terms of hospitals and dispensaries roughly reflect the stage of development of each Province.

It is estimated that only 4 per cent. of the total African population live in towns—the rest live in rural areas. In this series of 252 admissions it was found that 24.2 per cent. of the patients had lived in towns. This does not necessarily mean, however, that the incidence of insanity amongst Africans is higher in the towns than in the rural areas for when a sample of 250 patients was taken from 5 general hospitals in the Territory it was found that as many as 33.4 per cent. of the patients were town dwellers. It seems that Africans who live in towns take more advantage of the medical facilities available than those who live in the rural areas. Moreover, peculiar behaviour is more likely to be brought to light in a crowded town compared with the relative isolation of the African village in the bush.

Age (see Table II). The mean age of the patients in the present series was 32.044 with variance of 0.5272 and standard error 0.7260. There was no significant difference between the mean age of the organic group and the affective group and between the schizophrenic group and the undetermined group, but the mean ages of the former two groups were significantly higher than the latter two. The mean age of the epileptic group was significantly higher than the M.D. group (Students' "T" test) and both these were significantly lower than the other groups.

The assessment of an African's age must often be made on clinical judgment alone as many Africans have no idea how old they are. It is possible, therefore, that European assessment of African age may be a gross underestimate. Carothers (1948) found that the average age of 609 new admissions to the mental hospital in Nairobi was 33.3 years and that 78 per cent. of the admissions were between the ages of 10 and 40, compared with only 42 per cent. in the U.S.A.

Sex (see Table II). In this series there was a sex ratio of 2·8 male to 1 female. Comparable figures from other parts of Africa are as follows:

				<i>Male:Female Ratio</i>	
Gold Coast (1939-1947)	..	..	..	9	: 1
Nyasaland (1936)	..	..	..	6	: 1
Nigeria (1937)	..	..	..	6	: 1
Kenya (1939-1943)	..	..	..	2·5	: 1
South Africa (1950)	..	..	..	1·9	: 1

In England, Slater (1935) found the incidence of mental disorder in the two sexes differed only very slightly, and the marked difference in Africa is difficult to explain. Carothers (1948) explains the difference on the grounds that women are more easily controlled at home and Shelly and Watson (1936) point out that native women lead a circumscribed and protected life. These facts alone cannot account for the difference, for in some tribes, the Bahaya for example, the women bear most of the household responsibility and do all the manual work while the men sit and gossip. Again, Carothers mentions the high certification rate in detribalized Africans in Kenya. In the present series only 19 patients could be described as detribalized and two of them were women.

Generally, the African female in Tanganyika leads a more occupied life than the male and, perhaps, has less time to worry and brood over misfortunes. Also, only about 10 per cent. of the 9 per cent. literate Africans in the Territory are women, so stresses connected with education are minimal. Lastly, because of the African woman's place in society, she is rarely called upon to make decisions, with a consequent lack of tension. That madness is less common amongst women seems to be generally accepted by the Africans themselves—"God willed it so"—and until a scientific explanation is forthcoming, we must leave it at that.

DIAGNOSTIC CLASSIFICATION

TABLE II

Diagnostic Classification of 252 Admissions to Mirembé Hospital During 1954

Classification	Mean Age and Variance of Mean	Admissions		Male/ Female Ratio	Total
		Male	Female		
Predominantly Schizophrenic	29·478 (1·2540)	46	21	2·2 : 1	67 (26·59%)
Predominantly Affective	37·725 (2·2375)	34	17	2 : 1	51 (20·24%)
Organic States	37·500 (2·7730)	49	17	2·8 : 1	66 (26·19%)
Epilepsy	25·042 (—)	23	3	7·7 : 1	26 (10·32%)
Mental Defect	19·000 (—)	5	3	1·9 : 1	8 (3·17%)
Unclassified Psychoses	32·000 (3·1033)	24	10	2·4 : 1	34 (13·49%)
Totals	32·044 (0·5272)	181	71	2·6 : 1	252 (100%)

The differential diagnosis of mental disorder in Africa is largely dependent on clinical observation of the patient in hospital. A reliable case history cannot often be obtained as many patients arrive at hospital with only the briefest description of their illness in their record and usually unaccompanied by anyone who knows anything about them. Moreover, most Africans have an inadequate vocabulary to describe the mental symptoms they may experience and many arrive so mentally ill that they are incapable of giving any account of themselves or their illness. Leading questions are useless because it is characteristic of the African, when in doubt, to agree with anything that is suggested by a European.

Language difficulties are a serious handicap and may make the taking of an accurate case history quite impossible. Without full understanding of the niceties of a language, thought content is difficult to explore and deviations in the progression of thought difficult to detect. Hallucinations and alterations in mood are fortunately fairly easy to recognize as the African shows his feelings in his face.

Hallucinations are, however, not readily admitted and delusional systems are difficult to bring to light because of their almost invariable association with witchcraft which the native is often reluctant to discuss or fears to disclose. Even the patients orientation is hard to determine as many normal Africans have no idea of anything that exists outside the confines of their village in the bush. Thus grasp of information may have to be estimated by whether or not the patient knows the name of his local headman and tests of memory may be limited to whether the patient can remember the volume of the last rains. The diagnosis of mental illness in Africa, therefore, depends mainly on the general appearance, conduct and behaviour of the patient and a systematic verbal analysis to determine the adjustment of the personality to its environment as practised in modern psychiatry can rarely, if ever, be attempted.

Even when these difficulties in diagnosis are taken into account, however, a striking similarity is found between the various types of African insanity and most writers on African psychiatry have recognized this fact and have experienced difficulty in separating the clinical material into the categories recognized in Europe. It has already been mentioned that group unity and uniformity of custom, resulting in the individual knowing the whole culture of the group and wanting to be exactly like the rest of the group, is fundamental in African culture. Also, it was mentioned that individual differences in African physique and personality do not seem to be so marked as in Europe. It seems reasonable to suppose that such factors might lead to a certain similarity in the symptomatology of psychiatric syndromes.

It has not, therefore, been possible to separate the functional psychoses into clear-cut schizophrenic and affective groups. Many cases present as mixed schizophrenic-affective syndromes and the best that can be done is to divide the functional group into those that are predominantly schizophrenic and those that are predominantly affective. Even when this has been done there still remains a fairly large group of undetermined cases which cannot be fitted into any known psychiatric category. Indeed, some forms of mental illness seem peculiar to Africa.

PSYCHIATRIC CATEGORIES

Schizophrenia

Both hebephrenic and catatonic forms of schizophrenia occur which resemble the condition found in mental hospitals in England but most of the

TABLE III

*Clinical Subdivision of 67 Cases Presenting Predominantly
Schizophrenic Symptomatology*

	Male	Female	Total
With Hebephrenic features	11	11	22
With Catatonic features	18	10	28
Paranoid Psychoses	17	0	17
Total	46	21	67

cases are amorphous. The paranoid form is very rare and the typical condition described in English text-books seems hardly to exist amongst the rural population of Tanganyika. Adeoye Lambo (1955), discussing the role of cultural factors in paranoid psychoses among the Yomba tribe in South-western Nigeria found "among the non-literate 'bush' Yomba tribe the form and content of paranoid Schizophrenia is culturally determined, while the picture of paranoid schizophrenia occurring in the literate (Westernized) section of the tribe is, in large measure, identical with that found in Europeans". In this series there were no cases, even among literate Africans, that bore any close resemblance to the paranoid form of schizophrenia as it occurs in Europe. Instead there was a group of "paranoid psychoses" which seemed to have little in common with any recognized psychiatric illness.

Although the number of patients in this group accounted for 26·59 per cent. of the total number of admissions, the actual number of patients who showed schizophrenic symptoms was very much larger. As Curran (1951) points out, "it is important to distinguish between schizophrenic symptoms, which may occur in a number of psychiatric conditions, and schizophrenic illness". The mere presence of symptoms loosely called schizophrenic (or catatonic) does not necessarily mean that the patient is suffering from schizophrenia and this point is well brought out in African psychiatry. Schizophrenic symptoms of some kind, such as withdrawal, habit deterioration, incongruity of emotional response, often accompanied by delusions and hallucinations were common throughout the whole series—particularly in the organic group.

There is so far no general agreement on the aetiology of schizophrenia and we do not know to what extent constitutional factors are concerned in the production of symptoms. Tooth (1950) in his study of mental illness on the Gold Coast remarks, "Among the bush peoples a typically schizophrenic picture is most likely to be due to organic illness, while schizophrenia itself appears as an amorphous, endogenous psychosis. Owing to unreliable case histories it was impossible to tell what proportion of the cases under review had shown a "shut in" type of personality before illness and it was possible to find a hereditary factor in only 6 cases. An asthenic or athletic type of physique was not a noticeable characteristic of these cases.

There is no doubt, however, that schizophrenia is the commonest psychiatric disorder in East Africa. Carothers (1954) referred to schizophrenia as the example of African psychosis *par excellence*, and Shelly and Watson (1936) in their survey of mental patients in Zomba Hospital found "schizophrenic psychoses predominate as the common type of disorder".

Hebephrenic Group

Most of the patients in this group were admitted with a history of oddities of behaviour and a progressive indifference to their surroundings so that they

were unable to look after themselves. Childishness, silly giggling, lack of attention to personal hygiene and dress, with bizarre delusions and hallucinations were the prominent symptoms.

Catatonic Group

The onset was usually an acute attack of excitement with anti-social behaviour such as assault, damaging property, predatory wandering, singing, shouting, dancing and going naked in public. The clinical picture was one of stupor and periodic attacks of excitement which were often of savage intensity. During the course of the illness strange attitudes, stereotyped movements, echo actions and the ceaseless repetition of a phrase or a snatch of a song were common. Nine patients showed catalepsy and automatic obedience was frequently seen. Negativism was rare. Recovery after 9 to 12 months was the general rule but relapses were frequent. Three of the cases were re-admissions.

Paranoid Psychoses

In this group the predominant feature was a more or less unsystematized delusional system with hallucinations. The most striking feature of the paranoid psychoses was the almost complete absence of any sexual trend in the delusions. None of the patients in this series made any reference to sexual conflict, whether heterosexual or homosexual. Thought disorder was not prominent and the affect was usually well preserved and appropriate. Habit deterioration was not marked. The patients were usually sent to hospital because their delusions made them a nuisance or a danger to others. Often the delusions cleared up after a few months leaving a fairly well integrated personality. It is noteworthy that there were no female patients in this group. The following cases may help to illustrate this variety of African psychosis:

Case 1. C.K. Age 35, Male. Tribe—Mfipa. Pagan. Illiterate.

Delusions of Bewitchment

This man was sent to hospital because he was said to be dangerous, stealing cattle and attacking people without reason. On admission he could give a reasonable account of himself but said he had been bewitched. He said the witch was a man he had fought three years previously. This man, he alleged, influenced the people of his village so they mixed his faeces with the faeces of animals and this concoction was put in his beer and he was forced to drink it. Since then he had been mad and a devil came into his head and made him want to kill people and destroy their property. His mood was slightly depressed but he did not appear to be hallucinated. The delusions persist. He is well behaved and gives no trouble.

Case 2. S.A. Age 26. Male. Tribe—Ngoni. Christian. Illiterate.

Delusions of Persecution Followed by Delusions of Grandeur

This man was sent to hospital from a sisal estate where he was employed, and was said to be violent and dangerous. He said he had visited his sister who had given him food. After eating, a voice told him it was poisoned food. He felt a pain in the head and then went mad and broke all the household vessels. The neighbours rushed in and tied him up and took him to the District Commissioner who sent him to hospital. On admission, he insisted he had been poisoned by his sister but he had already had his revenge as he had put a curse on her house which was now burnt to the ground. He had also received this information from a voice. Later he said he was sorry he had caused the house to be burnt down as "we must look at things like Jesus did", but this produced a new delusion and he said that he was Christ descended upon earth again. After about six months the delusions disappeared and he became apparently normal and most mystified how he could have imagined such things.

Case 3. M.M. Age 35. Male. Tribe—Msukuma. Pagan. Illiterate.

Delusions of Grandeur

This man was picked up by the police who found him wandering. He had assaulted a woman who had refused to cook food for him when he told her he was the head of the government. Some of the court proceedings are worth recording. This is part of his evidence:

Court: Who are you and what are you doing here?

M.M.: I am the Government. All these men in court are my sons. This man (pointing

to a person in the Court) is a doctor as well as a headman. If you ask me any more questions I will drive you all away. All men may go home now and the war is finished.

On admission to hospital, he still insisted he was the head of Government and the Church and he had great powers. His manner was aloof and arrogant and he said he had come to hospital to put his affairs in order. Most of the time he behaved fairly well, but there were periods, if he was thwarted in any way, when he became violent and destructive, tearing his clothes. He was very hallucinated and admitted that voices told him he was the head of Government. After three months he lost the delusions. He said that he remembered thinking that he was the head of Government and the Church but he must have been mad. He said he was only a simple peasant and asked politely to go home.

Case 4. S.K. Age 30. Male. Tribe—Msambaa. Christian. Illiterate.

Delusions of Persecution by Children

This man was an ex-soldier of the K.A.R. who had a small farm in the bush. Nothing peculiar had been noticed about his behaviour until, one day, two boys aged 8 and 9 came and stole some maize from his farm. He caught one of the boys and beat him. Soon after he complained to the local headman that the children came to his house at night and tried to kill him. The headman laughed at this story and told him he was mad. Soon after, S.K. became excited and said that the children had influenced his neighbours, and they too planned to kill him. He chased the people round the village with a knife and evaded capture for some time by hiding in the bush. Eventually the headman brought him before the District Commissioner who put him under medical observation. In spite of the fact that he was said to be hallucinated and talked irrelevantly, he was discharged. As soon as he got home the imaginary children returned to torment him and again he chased his neighbours with a knife. Finally, on the plea of his brother and the long-suffering headman, he was sent to hospital. On admission he was still convinced that the children were trying to kill him and they had put the whole of his village against him. He did not appear to be hallucinated but was terrified that the children would come to Dodoma to kill him. He is a large burly man and he says that every night he prays to God to protect him from the children who once told him they would kill him as he was a Christian.

TABLE IV

Clinical Subdivision of 50 Cases Presenting Predominantly Affective Symptoms

	Male	Female	Total
With Manic features	29	7	36
With Depressive features	5	10	15
Total	34	17	51

Affective States

Most writers are agreed that mania is a fairly common disorder amongst Africans, possibly more common than in Europe. On the other hand depressive psychoses are comparatively rare. Although typical attacks of mania and depression occur in Africans, many of the cases are amorphous and the picture is often complicated by schizophrenic or confusional symptoms. The following description can only give a general picture of the main symptoms of the affective states as they occur in Africa. Many more men suffered from mania than women but, in the depressive psychoses, twice as many women were affected as men. A pyknic habitus was not a characteristic of the affective states.

Manic Reaction

Mania affecting African women is more striking than in men for the African woman in Tanganyika is usually of a shy, retiring nature. The history was nearly always the same and in almost every case the event that led to admission to hospital was an act of violence. Usually the relatives had noticed that the patient had become over-talkative and this had led to interference in the affairs of others and aggressive behaviour. Eventually some quarrel had arisen, usually because the patient could not get his own way. On reaching prison the patient was recognized to be mentally ill and sent to hospital.

On admission the picture was fairly consistent. Patients usually arrived in a

very poor physical state. Many were very emaciated, having been so distractable they had eaten little or nothing for days or even weeks. Many patients were confused and showed catatonic symptoms. Sometimes it was not until after the physical condition had improved that the picture of mania emerged. The patients talked continually, laughed and joked, and jumped about like monkeys. The mood was usually one of sustained elation. They grabbed anything they could lay their hands upon to decorate themselves but delusions of grandeur and the grandiose scheming, common in England were rare. If these patients were thwarted in any way they usually became violent and dangerous. Even with large doses of sedatives, patients were often extremely destructive. One patient managed to extract a huge stone weighing more than 30 pounds from a wall with his bare hands. The acute symptoms could usually be controlled by E.C.T. the effect of which was little short of miraculous.

The average duration of the stay in hospital for African manic patients was usually from three to four months, but the relapse rate was high. Six of the cases were re-admissions and there was a strong tendency towards chronicity. A history of emotional disturbance connected with the onset of mania was fairly common.

Depressive Reaction

In depressive states the condition is more striking in males than females. In the male African a depressed mood contrasts strangely with his normal care-free, gay and irresponsible attitude. Again, as in the manic reaction, it is often an anti-social episode that brings the patient to hospital. The depressed state in Africans may sometimes change rapidly to a savage anger but there is always a reason for the outburst and the attack is well directed which helps to distinguish it from the impulsive outbursts of the schizophrenic. Symptoms of anxiety and agitation associated with depressive states in Africans seem to be very rare.

Depressed patients do not usually arrive at hospital in such a poor state as the manic cases. Many cases are mute and the mood is one of deep, persistent, steady gloom. The difficulty in thinking is conspicuous and replies to questions are delayed and slow but eventually to the point. Above all, these depressed patients are painfully slow in their actions and they must be led to their meals and even to bed. Sleep disturbances are not marked. Hallucinations are rare. The danger of suicide in depressed cases does not seem to be so serious as in England though African patients sometimes attempt to harm themselves.

Refusal of food is not common and tube feeding is very rarely necessary. When food is relatively abundant, as in England refusal is common but, in Africa, where food may be scarce and is of primary interest, it becomes a rare form of expression in depressive illness. Hypochondriasis is very common but ideas of sexual guilt were never encountered. This is understandable because health is another primary interest of the African, whereas sex is looked upon as relatively unimportant. There are no recriminations over mistakes in the past or the hopelessness of the future. But, while guilt feelings and self-reproach were absent, a feeling of bewitchment was almost universal. The form of these delusions helped to distinguish the depressive from the schizophrenic psychoses. The depressives believed their bewitchment had been brought on by themselves, while the schizophrenics blamed other external influences. It seems possible that the feelings of moral guilt often expressed in depressive psychoses in Europe may have their counterpart in the feelings of bewitchment suffered in depressive psychoses, by the superstitious, rural African.

No patients were classified as involuntional. The classical picture described by Henderson of depression without retardation, anxiety and agitation, feelings of unreality with hypochondriacal or nihilistic delusions was never seen. Five of the female melancholics had given birth within six months of developing symptoms. All of the 10 female patients classified as depressive states responded well to E.C.T. A history of emotional upset prior to the breakdown was rare and the depression usually seemed to have come out of the blue. It is probable, therefore, that these cases correspond with the so-called endogenous depressions in English psychiatry, though why the condition should be so much more common in African women than men is difficult to explain.

Case 5. K.J. Age 40. Female. Tribe—Mbondei. Christian. Illiterate.

Depressive Psychosis

This woman had been reported by her local headman to have been behaving in a peculiar way for about a month. Eventually she ran away from her village and threw herself in front of a car on the main road. She fell into a ditch and the driver of the car pulled her out, not seriously hurt, and gave her into the hands of the police. On remand she was reported to be mentally dull but could reply to questions fairly well. On admission she was deeply depressed and her movements were slow and laboured. Her replies to questions were sensible but very delayed and she said she felt bewitched. She was solitary and silent except for occasionally making vague complaints about her health. If she was disturbed by other patients she became aggressive and violent and wept angry tears, tearing her clothes. The Kahn test was positive but there were no neurological signs and she gave a history of yaws.

TABLE V
Clinical Subdivision of 66 Organic States

	Male	Female	Total
Toxi-infective Psychoses:			
Malaria	7	3	10
Sepsis	2	0	2
Chicken pox	1	0	1
Organic Dementias:			
Senile dementia	9	5	14
Arteriosclerotic dementia	1	1	2
Syphilitic psychoses	14	6	20
Trypanosomiasis	2	0	2
Nutritional Psychoses:			
Pellagra	4	1	5
Polyneuritis	2	0	2
Traumatic:			
Head injury	0	1	1
Psychoses due to Drugs:			
Alcohol	4	0	4
Cannabis indica	2	0	2
Atebrin psychosis	1	0	1
Total	49	17	66

Organic States

In Tanganyika, diagnosis must be made mainly on clinical signs and symptoms because aids to diagnosis such as electroencephalography, air studies and angiography are not available. The most valuable aid to diagnosis is the examination of the C.S.F. A routine examination of blood, urine and faeces, including a blood Kahn, is carried out on all patients on admission.

Lumbar puncture is not performed as a routine procedure but is only used to confirm a diagnosis if any doubt exists.

The organic dementias showed little difference from the condition in England, except that catatonic symptoms occurred more frequently. The two cases of arteriosclerotic dementia were confirmed at post-mortem. Generally arteriosclerotic dementia seems rare in Africa and essential hypertension, with attacks of hypertensive encephalopathy, has very rarely been recorded.

Spirochaetal infections of the central nervous system were common. The Kahn test was positive in 19 men and 14 women, but it must be taken into account that the test also gives a positive reaction to yaws. Twenty-nine cases were diagnosed as cerebral meningo-vascular syphilis and there was 1 case of G.P.I. There were no cases of tabes or tabo-paresis. The cases of cerebral syphilis showed various neurological signs, particularly ocular palsies and alterations of the deep reflexes. The case of G.P.I. showed typical Argyll Robertson pupils and expansive delusions. The symptoms of G.P.I. in Africans, and the post-mortem pathological findings, are very similar to the text-book descriptions of the disease in the last century. It seems rather anomalous that G.P.I. should ever occur in a country where the incidence of malaria is so high.

The two cases of trypanosomiasis were indistinguishable from schizophrenia. The Sleeping Sickness Specialist of Tanganyika gave the following comment on the incidence of insanity in Rhodesian Sleeping Sickness. "Rhodesian Sleeping Sickness is typically an acute virulent infection and, if untreated, the person affected dies quickly. If treated early complete cure can be expected. If treatment is delayed or incomplete the disease may progress to the C.N.S. and, if no further treatment is given, the patient will die within a year or two getting more dull mentally as the disease advances. Tryparsamide in these cases may only prolong the process and, very rarely, cases become insane being indistinguishable from the gambiense infections. Mel. B. cures a far greater proportion of cases but there are still occasional patients who deteriorate in the same way as those treated with tryparsamide. As an important cause of insanity in Tanganyika I feel quite sure that Sleeping Sickness can be discounted. Far more often, I think, it is the person who is already insane who, because he goes wandering about the bush—or in some cases he may even be pushed out by, his family—gets infected." The two cases in this series were unsuccessfully treated cases who may well have been insane before they contracted Sleeping Sickness.

Epilepsy

Only those cases for which no organic cause was detected were included in this group. Owing to the lack of modern aids to neurological diagnosis a number of interesting organic cases may have been missed. A large field is open for the investigation of the incidence of cerebral bilharziasis and ascariasis and other infections of the central nervous system by parasitic organisms. In the absence of any clinical signs pointing to organic disease these 29 cases of epilepsy must be classed as idiopathic.

Mental Defect

By European standards many bush Africans leading normal lives would be considered feeble-minded but nutritional, infective and cultural factors must be taken into account. In this series only 8 cases were so classified. These cases all fell in the imbecile class and there was one case of epiloia and one case of bilateral athetosis. There were no Mongols in this series and I have never seen

one in Africa. It is possible that Mongolism exists but those affected die in infancy in the bush from respiratory infections. Both Carothers (1954) and Tooth (1950) remark on the rarity of Mongolism and I have yet to meet the doctor, nurse or midwife who has seen this condition in Tanganyika. Six cases of Mongolism have, however, recently been reported from Uganda (Luder and Musoke, 1955).

Few problems relating to the attitude to and the care of mental defectives in the village and in the nomadic community have yet arisen, but plainly, with social advancement these problems will become increasingly urgent and the provision of special hospitals for defectives will have to be given consideration. At the present time most stable defectives are looked after at home and the unstable are more likely to find their way to prison rather than the mental hospital. So far there is no system of ascertainment of defectives comparable to England in Tanganyika and no intelligence tests have yet been standardized for use with East Africans.

Psychopathic Personality

No cases in this series were classified as psychopathic personality. It was found impossible to tell from case histories whether patients had shown abnormal behaviour from an early age. Moreover, what might appear abnormal behaviour by European standards might be perfectly normal through African eyes. Eight cases, which were placed in the unclassified group, were admitted following various anti-social acts such as unprovoked assault, chasing people with knives, arson and theft. In 7 of them there was no recognizable mental illness and they were discharged after a period of observation. The remaining case made a savage attack on a fellow patient shortly after admission. These 8 cases would probably have been classified as psychopathic personalities in England but it must be mentioned that if every African in Tanganyika who showed anti-social behaviour of this kind was sent for psychiatric observation it would be necessary to open several more mental hospitals. Such cases only rarely reach hospital and are usually dealt with by the people themselves. Much that goes on in the bush is never heard of. For example, it is well known that a common way in rural Africa of dealing with an enemy of society is to burn his house down and, if feeling is running very high, the enemy inside it. The time is within living memory of members of some tribes when partners in adultery were burnt alive, thieves had their hands cut off and weregeld was paid for murder.

Psychoneurosis

In the primary diagnostic classification of this series no cases were categorized as psychoneurosis. In Tanganyika mental patients who are sent for admission to hospital are nearly always found to be suffering from florid psychotic symptoms.

(1) *Anxiety States.* Mild anxiety states, in which the patient may complain of palpitations, precordial pain and shortness of breath, do occur in Africa but they are more likely to be seen in the out-patient department of a general hospital rather than a mental hospital. Severe anxiety states in pure culture are very rare, in fact, so rare that one might speculate on the possibility that other, maybe psychotic, reactions take the place of anxiety in African psychiatry. It is interesting that overt anxiety symptoms are not prominent features of any of the psychoses. Notably, in the depressive psychosis anxiety symptoms were almost absent.

(2) *Hysteria*. The hysterical reaction is the most common neurotic manifestation in Africa. Dembovitz (1945) referring to West African troops, stated, "Hysteria is the hall mark of psychiatry in Africa. The hysterical mechanism, is so readily employed that conversion symptoms colour not only neurotic depressions and anxiety states but also true psychoses." These remarks also apply to Tanganyika, but few cases of pure hysteria ever reach a mental hospital. The wards of general hospitals in Africa, however, contain many illnesses of hysterical origin.

The frequency of the hysterical reaction is interesting in the light of the apparent similarity of the African personality to the unstable European psychopath. Mayer-Gross *et al.* (1954) remark, "of all psychiatric syndromes, hysteria and the hysterical personality provide the nearest analogy to the unstable psychopath. The two are often seen combined, and in the irresponsible psychopath there is an emotional immaturity very like that of the hysteric."

The form of hysterical reaction found in Africans is relatively primitive and near the surface of consciousness. Somatic symptoms and hysterical fits are common. It is paradoxical that the African will make a great fuss over hysterical complaints but will tolerate severe physical pain without much mental distress. For example the African may suffer the severe pain of an emergency tooth extraction with indifference while the prick of hypodermic needle will bring forth cries of anguish and an expression of torture.

The physical endurance of the African is also remarkable. Weedy, undernourished Africans think nothing of walking 30 miles a day with heavy loads. Sometimes they drop by the wayside and die. The following case illustrates the African's indifference to suffering and how, through his physical endurance and resilience, he may recover from an almost hopeless illness and live. It also illustrates how, in the presence of psychological trauma, he may react by hysterical symptoms, "turn his face to the wall" and die.

Case 6. A.M. Age about 70. Tribe—Mluguru. Pagan. Illiterate.

Strangled Sigmoidorectal Intussusception. Hysteria

This old African had been ill in the bush for 10 days and native medicines had failed. He had eaten nothing for a week and had been vomiting continually for three days. He then walked twenty miles to hospital from his native village with a mass of prolapsed bowel, the size of a baby's head, hanging between his buttocks. The prolapse contained a tangle of necrotic sigmoid and an operation, which amounted to an abdomino-perineal resection of the rectum, carried out under primitive conditions, left him with a left inguinal colostomy. He made an uneventful recovery and after two months was well and fit for discharge. However, when he was told that nothing further could be done he refused to leave hospital. He said he could not return to his village as he was not now like other men. He refused to eat, made vague complaints about abdominal pain, and said he was going to die. In spite of efforts to save him he was dead in a fortnight.

(3) *Obsessional Neurosis*. Obsessional neurosis is almost unknown amongst Africans and I have never seen a typical case. Obsessional behaviour is, however, sometimes seen in the psychoses. One of the schizophrenic patients in hospital carries out complicated rituals before meals. Carothers (1954) points out that obsessional symptoms are ubiquitous and often quite disturbing in European children, and the parallel to African modes of thinking is clearest in these children. It seems possible that rural Africans, children and adults, seldom or never develop such reactions on individual lines, since this behaviour is the normal pattern of their lives. Davidson (1949) thought the whole of the Bemba tribe in Northern Rhodesia was suffering from a permanent obsessional neurosis. "They are constantly obsessed by thoughts demanding the prompt performance of counter ritual, and each person is thus saved from an individual neurosis."

Unclassified Psychoses

This group contains cases that could not be fitted into any known psychiatric category and forms the most interesting clinical material to be found in African psychiatry. Eight cases in the group were admitted for various anti-social acts and were probably aggressive psychopaths by European standards. Seven cases were frankly undiagnosable. The remaining 19 cases were "frenzied anxiety", showing a fairly typical picture of the condition described by Carothers (1948), and it would be impossible to better his description. "In this condition the onset is associated with some real source of anxiety (perhaps only real to an African) but the anxiety is not sustained and is soon replaced by a state of frenzy in which the patient is excited, noisy, incoherent, and perhaps filthy, aggressive and dangerously violent. The violence often results in homicide but is apt to be ill-directed and generalized, and the supposed author of the patient's anxiety may not be among the victims. Recovery usually occurs in a few hours or days and is as complete as it is rapid. The subject subsequently always denies all memory of the frenzy." Carothers believes this condition to be a psychopathic episode with hysterical elements and suggests these cases may replace in Africans many of the types of anxiety neurosis and perhaps some of the depressions that are found in England.

SOME AETIOLOGICAL FACTORS OF SPECIAL IMPORTANCE IN AFRICAN
PSYCHIATRY TODAY

1. Cultural Factors

(a) *Education.* It has been estimated (Table I) that only about 9 per cent. of the total African population in Tanganyika have ever attended school. The literacy rate is not known but is probably lower than 9 per cent. of the total African population because all Africans who go to school do not necessarily learn to read and write.

In the series of 252 admissions to Mirembe Hospital during 1954 a high percentage of the patients had attended school. 27.7 per cent. of the 252 admissions had received education and were literate in the vernacular. Of these 10 could write English. The literacy rate was not significantly higher in any one of the psychiatric categories but the largest number of literates was found in the affective group.

It might appear, therefore, that education is a significant factor in the incidence of insanity in Tanganyika. Statistically, however, this cannot be proved. The literacy rate of 250 patients admitted to five general hospitals in various parts of the Territory was obtained and it was found that as many as 32.8 per cent. of the patients in general hospitals were literate. It appears that the educated part of the population simply takes more advantage of the medical facilities available and this might apply to mental as well as general hospitals.

Nevertheless it is probable that the effect of education does play some part in the aetiology of mental disorder in Tanganyika for, with education, comes choice leading to doubt and tension. Moreover, education sows the seed of ambition and a desire for higher social and ethical standards. Often these experiences and ideas cannot be shared, and, in a backward country like Tanganyika, the individual may find himself relatively isolated. The educated African finds little in common with the uneducated members of his own people; he shows little inclination to associate with the Asian community, and he is still socially unacceptable to the majority of Europeans. This must, necessarily, lead to frustration and anxiety.

The African's desire for education seems to arise mainly from egotistic motives, and the educated African often shows little desire to put his knowledge to the good of the community. Tooth (1950) referring to West African natives, says, "The basic attitude of the illiterate African to the European is almost certainly founded on the belief that the white man has some secret power which enables him to live in luxury with a minimum expenditure of physical effort. The literate has, through his knowledge of the language, taken the first step towards acquiring similar power.

"The adoption of expensive and on the whole unsuitable European dress by those who are in no way obliged to wear it, is a further step towards closer association and is probably an example of imitative magic. Except so far as he has been forcibly prevented from injuring his neighbours either by direct violence or by insanitary habits, Western culture has not been forced on the African; rather he has asked for and greedily accepted it."

The African goes through the stages of his education without many of the ups and downs experienced by the European, who, at many times, has his self importance deflated as he advances from one standard of education to the next, and from one walk of life to another. The adjustment to such changes produces, in the European, the ideal of tradition of service, obedience to the consensus of opinion, and promotes adequate group integration at various levels. In the relative absence of background, tradition and consensus, the African does not have to adjust to such changes and, as his learning increases, so does his self esteem and self importance. As a result he is likely to devote his energies into the promotion of self rather than feeling that any success he may attain will benefit the community in the last analysis.

It has been observed by teachers, though there is no statistical evidence available, that African schoolchildren in Tanganyika learn quickly up to the age of about 12 but after this age the rate of learning falls off.

This falling off in scholastic performance coincides with the onset of puberty and interest in the opposite sex. The African has no moral code in the European sense, so, in the relative absence of social restraint, his instinctual needs are easily gratified and little energy is left over for direction into socially useful channels.

A group of 80 Africans, between the ages of 10 and 23, drawn equally from primary and secondary schools in Tanganyika, were given a battery of aptitude tests designed by Biesheuvel (1952) for Africans and it was found that the upper age group showed far less ability to perform the tests than would be expected compared with the lower age group. Children of 10 and 12 from the primary schools often obtained a higher rating than some of the secondary schoolboys of 20 although the latter had been specially selected by the Education Department for higher education. A group of 20 European schoolchildren, between the ages of 6 and 11, with an average age of 7, were given the same tests and it was found that their performance was roughly within the range of adult Africans. These results have not yet been examined statistically.

(b) *Religion*. The number of African Christians in Tanganyika Territory has been estimated at 1,112,322, or about 15 per cent. of the total African population. Moslems have been estimated to account for about a further 15 per cent. and the remaining 70 per cent. are Pagans. Many of the pagan tribes believe in a supreme being and in the possibility of communion with the spirits of the departed.

In the series of 255 African patients admitted to Mirembe during 1954, 40 per cent. of the patients were Christians, 20 per cent. were Moslems and the

remaining 40 per cent. were Pagans. The proportion of Christians appears significantly higher than expectation. When, however, the religion of 250 African patients, admitted to 5 General Hospitals, was obtained it was found that 38 per cent. of the patients were Christian, 21 per cent. were Moslem and 41 per cent. were Pagans—almost identical figures to the Mental Hospital. As Christianity is often associated with better education, more advantage may be taken of medical facilities by the Christian members of the African population.

It is probable, however, that many Africans adopt Christianity for conventional rather than ethical reasons. Tooth (1950) writing on aspects of Christianity on the Gold Coast, says, "though doubtless there are Africans who understand and live up to the full spirit of Christian teaching, particularly in families in which Christianity has been practised for many generations, it is safe to say that to the majority, membership of one of the churches is primarily a social asset".

Religious beliefs are, however, frequently reflected in African psychoses. Repetition of prayers, counting of beads, supplicatory religious postures, and hymn singing are common amongst the population of an African mental hospital. The following case illustrates a psychosis almost certainly connected with a stringent Christian upbringing.

Case 7. E.F. Aged 22. Female. Tribe—Chagga. Christian. Literate.

This girl came from a strictly religious family. Her father was a pastor and a devout Catholic and she was educated in a Sisters' Convent. When she was 19 she ran away from the Convent but refused to go home. She obtained sanctuary in a Mission and her father managed to persuade the Mission to employ her as a school-mistress. She did quite well for about a year but then began to behave in a peculiar way. In the words of the Priest in Charge, "she would wander off during the night and not return until 4 or 5 in the morning, saying that 'so and so' had invited her. People who were entirely innocent were being involved. She even wandered round the church during the service, and on one occasion she entered the sanctuary, where no woman is permitted." When arrangements were made for her to return to her father, she accused him of cruelty and ran off threatening suicide. Later she became violent and was admitted to hospital. At first she was quiet and docile but engrossed in religious thoughts. She prayed continually and performed expiatory rituals. After two months she became noisy, dirty, destructive, degraded and very impulsive. Eventually she responded to insulin and E.C.T. and was discharged to the care of her father after 9 months in hospital.

(c) *Witchcraft and Superstitious Beliefs.* In 1861 Du Chaillu wrote, "The greatest curse of the whole country is the belief in aniemba (sorcery or witchcraft). The African believes death to be always a violence. He cannot imagine that a man who was well two weeks ago should now be lying at death's door with disease unless some potent wizard had interfered and, by witchcraft broken the threads of life and introduced sickness." The position is unchanged today and the dictum that the native is quite incapable to realize death from any natural cause still holds good to a large extent.

Considering the influence of superstition on the African mind it is remarkable that European medicine should have made such great strides in Africa and this particularly applies to the field of psychiatry for insanity is still almost universally believed to be caused by witchcraft. The introduction of E.C.T. and the dramatic results that can be obtained with this treatment in African psychoses, has gone a long way to promote faith in European medicine. Nevertheless the witch doctor still holds great power in the bush and has considerable prestige. He is usually consulted, and native medicines tried, before a rural African comes for European aid.

The legend that the curse of the witch doctor can cause death may have some foundation in fact and many Europeans claim to have seen Africans die

following such a curse. It is possible that the witch doctor may be something of a psychiatrist himself and is able to select his cases. For example, if he is able to diagnose an incipient schizophrenic or depressive psychosis he stands a good chance of his curse being fulfilled because the unfortunate African who receives the curse often becomes an outcast from his community. Moreover, the suggestibility of the African personality must be taken into account. The following case illustrates how belief in bewitchment was connected with the death of a schizophrenic African girl.

Case 8. M.B. Age 20. Female. Tribe—Wabulu. Pagan. Illiterate.

Hebephrenic Schizophrenia—Hysteria

This girl was brought to hospital by her parents who said she had become unmanageable. She had been seen by a witch doctor who had said she was bewitched and that nothing could save her. She had been kept at home for about six months but the neighbours had complained about her living in the village and it was obvious that her parents were anxious to be rid of her as they too believed she was bewitched and feared she might bring trouble to them. They had utterly no faith in any treatment and said it was inevitable she must die as she was cursed. The girl was in a pitiful state, dirty and emaciated, sometimes giggling to herself in response to hallucinations and making facial grimaces. It was found she was infected with three different forms of intestinal parasite but no other organic disease could be found. Attempts were made to restore her physical condition but she became very apathetic, although she did not refuse food. As a last resort E.C.T. was tried but this also had no effect. She went slowly downhill and, about three months after admission, she died in stupor.

2. *Physical Factors*

It is probable, if there is sufficient diffuse disturbance, that any person, however physically constituted, will show a confusional reaction, but it is generally agreed that some people show this tendency more than others. Because of the prevalence of malnutrition and infection many Africans probably live on the verge of mental breakdown and a minor illness may be sufficient to produce psychotic symptoms. In the African, moreover, catatonic as well as confusional symptoms are prominent in psychoses associated with organic disease.

(a) *Parasitic Infection.* Table VI shows the incidence of parasitic infection in the 252 cases on admission to hospital. Many patients were infected with

TABLE VI
Incidence of Parasitic Infection in 252 Cases

									Cases
Malarial parasites	..	..	..	..	..	..	..	..	127
Ancylstomiasis	..	..	..	..	..	..	..	..	57
Bilharziasis (haematobia)	..	..	..	..	..	..	..	..	32
Ascariasis	..	..	..	..	..	..	..	..	31
Taenia maginata	..	..	..	..	..	..	..	..	15
Trichiniasis	..	..	..	..	..	..	..	..	12
Bilharziasis (mansoni)	..	..	..	..	..	..	..	..	3
Oxyuriasis	..	..	..	..	..	..	..	..	2
Amoebiasis	..	..	..	..	..	..	..	..	2

more than one parasite. This high incidence of parasitic infection, together with the prevalence of malnutrition, makes it understandable why so many patients arrive at hospital in such a pitiful physical state.

(b) *Nutritional Factors.* The importance of nutritional factors in African psychiatry cannot be overestimated. Recently Keys (1950) has shown that mental symptoms are prominent after prolonged semi-starvation in normal adults. Lack of sustained interest and concentration with loss of self control was observed and the mood was labile and irritable, often with apathy and depression. Keys' findings should, however, be taken with a certain reservation for

the conditions under which his experiment was carried out were very different from the conditions that obtain in tropical Africa. The element of insecurity was absent and, also, the liability to attack by infectious disease.

In Africa, the prevalence of a deficiency disease like kwashiorkor points to a widespread malnutrition in African children and this must lead to faulty development. The undernourished African child is apathetic, dull and peevish, and this retardation might well become permanent with prolonged malnutrition in later years. Holmes, Jones and Stannier (1954) found that African adult males who had previously suffered from severe protein deficiency remained in positive nitrogen balance for very long periods, but did not show weight changes at all corresponding to the calculated tissue retention. The administration of cortisone reduced the nitrogen storage but the dose necessary to do this was very large compared to the doses normally used for therapeutic purposes. While there are few data available about the response of normal humans to cortisone, these observations may indicate a hormonal balance in the African different to other races.

Only two cases in this series could definitely be attributed to malnutrition as the primary cause. Both showed catatonic symptoms which cleared up when the physical condition was restored to normal. Many African psychoses occur, however, on a background of malnutrition and much of the peculiarity of the African mentality might be explained on this account. The fact that it has now been shown that Africans who have previously suffered from malnutrition remain in positive nitrogen balance for long periods is interesting in the light of Gjessing's (1935) work on nitrogen metabolism in periodic catatonia and further research in this direction, in relation to the prevalence of catatonic symptoms in Africans, might be rewarding.

3. *Personality Variants*

(a) *Lack of Individual Differences—Personality.* The lack of personality differences amongst Africans has already been mentioned but whether the rarity of extremes of temperament is real or only apparent is difficult to say. Nevertheless it is doubtful if such concepts as introversion and extraversion have any application in African psychology. The East African is certainly not inclined to contemplation or the consideration of his own reactions and is not concerned with his "inner life". His personality, if anything, tends to extraversion in that he is actively concerned with the things that go on around him and the people with whom he has contact. On the other hand many of the things that go on around him he connects with magical forces and, therefore, these things must have some inner meaning for him. As the African has such a limited vocabulary it is impossible for him to describe his inner feelings and this makes it difficult to probe into his mind. He has no words to describe himself or his fellow men as aggressive or submissive, confident or anxious, trusting or suspicious. One might speculate that such adjectives have not entered his vocabulary because he would rarely have any use for them. Curiously, he is quick to notice variations in the European temperament and tries to describe the European in his own Swahili language, for example, "Bwana Kali" (lit. sharp) for aggressive. Such speculations however, do not carry us far as the apparent lack of individual personality differences in the African can, to a great extent be accounted for by uniformity of thought and custom.

(b) *Lack of Individual Differences—Physique.* Compared with the European race who show considerable variation in physique, ranging from the asthenic to the pyknic, the African shows little variation. There are marked differences in

stature between various tribes but the extremes of variations in physique, in the Kretschmerian sense, are very rarely found. The typical pyknic type of stocky build with a short massive neck and rotund abdomen, slender extremities tapering to small hands and feet, is a rarity. Also, the tall leptosomatic type, with small shoulders, flat narrow chest with a narrow costal angle, and long extremities is very rarely seen. Most East Africans could be classed as dysplastic. Beyond simple words like tall and short, fat and thin, the African has little vocabulary to describe physique and it is difficult to explain to African Hospital Orderlies the meaning of such words as pyknic which they may find in medical books. Illustrative examples have to be found among the European population.

The apparent lack of individual variation in the physique of the African opens a wide field of study. An experiment in Sheldonian typing might be illuminating but, although it might help to distinguish racial groups in a population, it is doubtful if it would be much help with individual differences in a single group of Africans. Clearly, however, some general idea of body build in different tribes, and in association with different diseases, needs to be gained.

4. *Effect of Drugs*

Psychoses due to drugs are fairly common in Africa. As in England, the addict usually indulges in more than one drug. In general the effect of alcohol on the African is more pronounced than in the European, and alcoholism is considered by the police to be one of the major causes of crimes of violence in Tanganyika. Most alcoholics end up in prison but a few, acutely delirious cases find their way to hospital. Although a few rich chiefs are habitual toppers chronic alcoholism, as we know it in England, is uncommon and alcoholic polyneuritis is very rarely seen.

Cannabis indica, which is usually smoked as "bhang" is used frequently as an intoxicant in Africa. Sometimes the bhang is mixed with different *Solanaceae* such as *datura* or *nux vomica*. *Datura* is also sometimes used by thugs to produce unconsciousness and, during the stage of recovery, the patient may be thought to be insane. It is a strange sight to see natives pulling imaginary threads from the tips of their fingers—a common occurrence in *datura* intoxication. Many cases which reach hospital may be due to intoxication with one or other of these drugs but diagnosis is usually impossible unless the patients admit taking them. If the six cases of psychosis caused by alcohol and bhang included in this series had not voluntarily disclosed taking these drugs to excess they would possibly have been classified in the undetermined group.

In view of the prevalence of schizophrenia in Africa and the frequent appearance of schizophrenic symptoms in other psychiatric conditions, one is tempted to conjecture whether the African is more prone to the development of schizophrenic symptoms than the European. With this idea in mind a controlled group of five Africans was given mescaline. The test groups were made up of ten volunteers from the hospital staff who were slightly above normal African intelligence. At 10 a.m. five of the men were given 300 mg. mescaline sulphate dissolved in water and five controls were given a dilute solution of magnesium sulphate. They were told that this was a new drug and they were to report any sensations they might experience. With the exception of one African, who pretended to be drunk for a short time, none of the control group showed any symptoms but the group who had been given the mescaline showed marked symptoms.

Within an hour they all complained of mild nausea and shivering, a general feeling of queasiness, and deep discomfort in the joints. After about two to

three hours these symptoms lifted and their behaviour became peculiar. They sat by themselves and giggled for no reason. Questions were often answered with a silly indifference. All the group said they felt as if everything had changed in some way and they wanted to be alone. One said "when I close my eyes I see an ocean with many ships. Now there is a huge building with many stories and a number of fearful snakes. I fear to close my eyes as I might see these terrible creatures again." Another said, "when I close my eyes I see a waterfall suddenly changing to sparks of fire", and another, "when I close my eyes I see unearthly creatures, sometimes similar to reptiles, suddenly changing in shape so that it is difficult to tell whether they resemble animals or plants". Swahili music played on a gramophone increased the vividness of the hallucinations and the creatures were said to dance in time to the music. It was noticed that an increase in the volume of the music would cause dilatation of the pupils. Curiously, none of the subjects noticed any difference in colour intensity at any time during the experiment. Each of the subjects was taken for a car drive round the local township which took about ten minutes. Afterwards, estimates of the time taken varied from twenty minutes to an hour.

The symptoms lasted all day but insomnia during the night was not complained of. By the following day the men were quite themselves again but, with the exception of one man, the general consensus was that the mescaline experience had been an unpleasant one and there was no desire to repeat the performance. The remaining man said he thoroughly enjoyed the experience. He said, in the past, he had smoked a fair amount of "bhang" (*Cannabis indica*) but he could see no similarity between the effects of this drug and mescaline. He liked mescaline better.

In such a small experiment it is impossible to reach any real conclusion but it may be noted that small amounts of mescaline when given to Africans cause marked mental symptoms. It is interesting in this connection that Jantz (1941) claims to have found gross abnormalities in nitrogen metabolism associated with mescaline intoxication and Holmes, Jones and Stannier have shown that nitrogen metabolism is abnormal in Africans who have suffered severe protein deficiency. Whether this abnormal nitrogen metabolism has any connection with an intolerance to mescaline in Africans and a predisposition towards the development of catatonic symptoms, which are so common in African psychiatry, it is too early to say.

CONCLUSION

Although we now have some idea of the cultural and physical background of the African in Tanganyika we have still little real understanding how these factors influence his personality and what bearing they have on mental illness. Without long term observation and accurate case histories it is impossible to tell to what extent mental disorder in the African is due to constitutional and psychological factors and to what extent it is due to nutritional deficiency and disease during the process of growth.

Because of the range of interest in this relatively new and unexplored field there is a great danger of being carried away by theoretical assumptions based on conventional European psychopathology. Therefore, I have attempted to confine my observations as far as possible to plain English. The apparent similarity of the African personality to the European psychopath might, for example, be explained by failure of development in the African of what we conceive as the super-ego. This is clearly dangerous ground, for many of the

personality traits in the African which appear psychopathic to the European may be due to the African simply lacking the physical means of monitoring behaviour. The Africans' personality may appear psychopathic through European eyes but there is no reason to suppose that the European does not appear equally psychopathic through the eyes of a rural African in the bush.

The African attitude to life is entirely different from the European attitude. His experiences and tendencies, from the moment he is born until the time he dies, are integrated in an entirely different cultural and physical environment. These factors must account for many of the anomalies in the African personality and, also, for many of the differences in the symptomatology of the various mental disorders in Africans, compared with mental disorders in Europeans. This applies particularly to the paranoid psychoses and the paranoid form of schizophrenia.

In the past much has been made of the similarity of schizophrenic thinking to the assumed pre-logical nature of the thought of primitive peoples but it is now generally contended that the latter do not think pre-logically but according to their lights. Nevertheless, African thinking is essentially based on sympathetic magic, and largely emotionally determined. Much of this emotionally determined thinking comes from primitive myths and I will conclude this paper with a reflection on the importance of such myths on African psychology.

There is a myth in Tanganyika that, in the beginning of things all the wealth of the world was unequally distributed so that the white races got the larger share. This myth is almost universal and very old and probably originated with the coming of the early traders to Africa and was only later applied to Europeans. It is believed implicitly not only by the bush peoples but by the more educated Africans and serves as one example of the mystic, emotionally charged beliefs so common in Africa. These myths give us some idea of the working of the African unconscious mind. Perhaps, when we find the African unreliable, untruthful, dishonest and treacherous, these failings may be due to an unconscious wish to settle accounts for imaginary injustices founded upon various primitive myths preserved in the racial unconscious postulated by Jung (1934). Kluckholm (1942) says "myths and rituals jointly provide systematic protection against supernatural dangers, the threats of ill health and of the physical environment, anti-social tensions and the pressure of a more powerful society". The study of myths and rituals may bring us to a closer understanding of the African personality, particularly with regard to his attitude towards the European today.

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A STATISTICAL STUDY OF THE INFLUENCE OF MARRIAGE ON THE HOSPITAL CARE OF THE MENTALLY SICK

By

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INTRODUCTION

THE handicap of the single as compared with the married state in respect of the first admission rates to mental hospitals has been demonstrated by several workers. Dayton (1939), Malzberg (1940) and Ødegaard (1946), to mention but a few, have all shown that the admission rates for single persons are greater than those for married persons of the same age. Hospital first admission rates for mental disorders are more likely to give reliable estimates of the incidence of mental disease than are hospital rates for other types of illness, nevertheless hospital admissions are but a sample of the sick population in the community and, generally speaking, there is no means of knowing whether or not it is a representative sample of the total sick population. For this reason, in this paper it is only the effect of marital status on the hospital care of the mentally sick that it is to be considered. This appears to be a necessary restriction in view of the fact that the data analysed here relate only to hospital admissions, but Ødegaard (1946) categorically stated, although his data, too, were derived from mental hospitals:

“It is shown beyond doubt that the incidence of mental disease is much higher in the single than in the married, and that this ‘predominance of the single’ among our insane is no statistical figment caused by such factors as differences in age distribution or in the tendency to hospitalize the insane.”

The purpose of this paper is not to discuss differential admission rates between single and married, although some data will be presented to show that the difference exists here as well as in Scandinavia and the United States, for I have dealt with that problem elsewhere.* The very great differences between the first admission rates for single and married persons led me to ask the question: “What other differences arise between single and married persons with respect to mental hospital care?” The data of a statistical study of mental hospital admissions which I have already completed provide some information on this point.

DESCRIPTION OF THE SAMPLE AND DATA

A brief description of the sample studied and of the methods of collection, compilation and analysis is a necessary foreword to a presentation of the results. In view of the fact that the methodology has been described fully in the monograph mentioned in the footnote below, only an outline will be included in this paper.

The admissions to two observation units and three mental hospitals in the County of London were the subject of this enquiry. For each person admitted during the 3-year period

* In a monograph with the tentative title “The Hospital Care of the Mentally Sick in the County of London”, which is in preparation for publication.

1947-49, a case summary card was made out on which salient points of the patient's history and progress in hospital were noted. This, the survey admission, could be either a first admission or a re-admission. Data included age, sex, marital status, previous psychiatric illness, legal status, duration of stay and method of leaving hospital. Each patient was then followed-up as far as possible until 31.12.51 and records of subsequent admissions were made. In the case of death, the certified cause was recorded. The survey included just over 10,000 patients of whom just under 9,000 were included by virtue of an admission to one of the two observation units considered and the remainder because they were admitted direct (i.e. without a previous observation unit admission) to the three survey mental hospitals.

In relation to the follow-up it must be stressed that it was not complete in the sense that for every person admitted there was certain knowledge of their "psychiatric" movements to 31.12.51. For example there were about 1,900 admissions to observation units which were terminated by the patient being discharged home after a short stay of about two weeks. Unless information from other sources showed that the persons were admitted subsequently either to an observation unit or to a mental hospital, they were assumed alive and well at the end of the follow-up period. This assumption is not so daring as it appears at first sight, for Harris *et al.* (in preparation), in a five-year follow-up of 125 schizophrenic patients, found that the duration of hospital care was highly correlated with the overall picture of the patient's state at the end of the 5-year follow-up, the state being assessed by diverse indices such as clinical condition, social independence, ability for employment and other socio-medical indices. In short, if patients experienced only a short admission in the first instance then in a very high proportion of the cases they were alive, out of hospital, socially independent and either completely recovered or with their psychiatric symptoms greatly improved. Conversely, a long stay in hospital augured a gloomy picture at the end of five years, the patients either having returned to a mental hospital, as in the great majority of cases, or remaining at home, dependent on relatives and with marked psychiatric symptoms.

Nevertheless, the fact that the follow-up was not complete might bias this sample in favour of a good prognosis, as measured by the hospital care needed during a follow-up period of between 2 to 5 years. A possible bias in the other direction is caused by the fact that 90 per cent. of the mental hospital patients were persons who were first admitted to observation units before transfer to a mental hospital. In the three survey mental hospitals alone only two-thirds of the patients were transfers from observation units. From the data of this study it appears that the prognosis of groups of transfers is not markedly worse than that for comparable groups who were admitted direct to the mental hospital so that the agency by which a patient enters the mental hospital is not likely to affect radically the subsequent requirements for hospital care. In this paper the data pertaining to all persons entering mental hospitals, whether by transfer from an observation unit or through other agencies, are considered. The groups of married and single patients will be compared with respect to the agency by which they entered hospital so that any possible differences in the hospital care resulting from different methods of entry to mental hospital can be eliminated if necessary.

The total sample included 8,312 persons admitted to mental hospitals during the triennium studied. They were disposed among sex and marital status groups as follows:

				Men		Women	
				No.	Per cent.	No.	Per cent.
Single	..	..	..	1,528	42.1	1,502	32.1
Married	..	..	..	1,486	40.9	1,804	38.6
Widowed and Divorced	..		..	619	17.0	1,373	29.3
All	..	..	..	3,633	100.0	4,679	100.0

Nearly all the persons in the group "widowed and divorced" were, in fact, widowed.

THE EFFECT OF MARITAL STATUS ON FIRST ADMISSION RATES TO THE SURVEY MENTAL HOSPITALS

It was possible to calculate first admission rates for the three survey mental hospitals, since it was possible to obtain for them approximate estimates of the numbers of persons by age, sex and marital status living in the areas which they served. The ratios of the rates for single and married persons have been cal-

culated taking due regard of the age difference between the two groups of patients. These are shown in Table I below.

TABLE I

Age-Standardized Ratios of the First Admission Rates of Single (R_s) to Those for Married (R_m) Persons

Diagnosis						Men	Women
						R_s/R_m	R_s/R_m
Schizophrenia	..	..	..	..	..	6.2	3.7
Manic depressive psychosis	..	..	..	..	..	1.8	1.6
Psychoses of old age	..	..	..	..	..	2.3	1.6
Other disorders	..	..	..	..	..	3.0	1.5
All disorders	..	..	..	..	..	3.5	2.0

It can be seen that the data of this study present a picture similar to those pertaining to the Scandinavian and American mental hospitals in that the rates for single persons are greater than those for married persons, particularly for schizophrenia where the rates for single men are six times and for single women four times that of married persons. The ratios in Table I have been standardized for age so that the differences between diagnostic groups are not due to differences in the age structures of the diagnostic groups.

COMPARISON OF THE SINGLE AND MARRIED POPULATIONS WITH RESPECT TO CERTAIN CHARACTERISTICS WHICH MIGHT AFFECT HOSPITAL CARE

There are some factors which might affect hospitalization. If the single and married populations show significant differences in these respects further comparison of the two groups might be rendered invalid unless these factors could be eliminated. The most important of these are: age, sex, diagnosis, date of admission to mental hospital, previous history of psychiatric care. The first three are so important that the total sample has been subdivided: by sex: into 8 age groups such as (i) under 20 years of age, (ii) 20-29 years, and then decennial groups to 70-79 years, (viii) 80 years and over: into 15 diagnostic groups which are as follows: schizophrenia; manic depressive psychosis, involutional depression; senile psychosis; cerebrovascular psychosis; epileptic psychosis; general paralysis; alcoholic psychosis; other specified organic psychoses, psychoneuroses; mental deficiency; disorders of behaviour and character; confusional states, not otherwise specified; symptomatic disorders and ill-defined conditions. This resulted in a potential total of 240 sub-groups, but as some age groups are not represented in some diagnostic groups, the actual number of sub-groups was somewhat less. Each of these has been examined according to the criteria mentioned below to see what differences, if any, emerge between single, married and widowed or divorced persons. Before an attempt was made to measure hospital care it was necessary to examine the sub-groups with respect to (a) date of admission, (b) previous history.

(a) The date of admission was important because the admissions surveyed occurred during a three-year period 1947-49 and the follow-up ended on 31.12.51. Admissions in the first half of 1947 had a maximum follow-up period of 5 years and a minimum of $4\frac{1}{2}$ years while for those in the second half of 1949 the corresponding follow-up limits were $2\frac{1}{2}$ and 2 years. In the main study the admissions were examined by cohorts according to date of admission but the additional labour which would have been involved for this study if the cohort method were adopted

would have been very great. It is necessary therefore to determine whether or not marital status and date of entry were correlated. It was found that they were not, therefore a cohort analysis was not necessary. The method used is illustrated by the following example. Of all schizophrenic men 7.1 per cent. were admitted in the quarter January to March, 1947. Among 236 single men 7.2 per cent. were admitted in that period, of 100 married men, 6 per cent. and of 32 others, 9.4 per cent. were admitted then. The differences between the three groups are small and well within the limits of chance variation. The results for this sub-group only are shown in Table II.

TABLE II

Date of Entry of Men Aged 30-39 Years Admitted With Schizophrenia

Date of Entry	Single		Married	
	No.	Per cent.	No.	Per cent.
January-March, 1947	17	7.2	6	6.0
April-June, 1947	16	6.8	6	6.0
July-September, 1947	29	12.3	8	8.0
October-December, 1947	15	6.4	10	10.0
January-March, 1948	16	6.8	9	9.0
April-June, 1948	17	7.2	5	5.0
July-September, 1948	15	6.4	9	9.0
October-December, 1948	25	10.6	7	7.0
January-March, 1949	24	10.2	8	8.0
April-June, 1949	19	8.1	10	10.0
July-August, 1949	17	7.2	11	11.0
September-December, 1949	26	11.0	11	11.0
Total	236	100.2	100	100.0

(b) The results of the main study showed clearly that re-admissions had a worse prognosis with respect to hospitalization than had first admissions. If there were differences between the marital states in this respect then a further sub-division of the sample into first and re-admissions would have been necessary. The three marital state groups were, however, similar with regard to the proportion of first admissions so that further sub-division was not necessary. Table III below shows the results for some of the main sub-groups.

TABLE III

Per cent. of First to All Admissions by Sex and Marital Status for Selected Age and Diagnostic Groups

Diagnosis and Age Group	Per cent. of First Admissions					
	Men			Women		
	Single	Married	Others	Single	Married	Others
Schizophrenia:						
20-29 years	56.5	69.4	41.7	65.1	68.1	69.2
30-39 years	52.5	58.0	50.0	55.4	60.3	61.9
40-49 years	48.4	51.6	55.6	56.6	55.7	60.0
50-59 years	44.4	59.4	64.3	71.2	58.1	76.3
Manic Depressive Psychosis:						
20-29 years	66.7	78.7	60.0	68.4	76.9	88.9
30-39 years	69.5	70.7	45.0	53.6	64.9	45.2
40-49 years	55.6	67.4	60.0	54.1	62.6	64.3
50-59 years	80.6	64.7	45.2	64.7	51.2	64.4
60-69 years	50.0	72.0	28.0	60.6	56.5	51.8
Psychoneuroses:						
20-29 years	85.7	75.0	100.0	88.9	84.6	75.0
30-39 years	69.2	90.0	100.0	82.4	82.9	100.0
40-49 years	66.7	94.6	100.0	50.0	82.4	60.0
Senile Psychoses:						
60-69 years	100.0	96.4	95.5	94.4	85.2	85.7
70-79 years	84.0	89.7	96.6	97.1	93.2	95.3
80 years and over	100.0	100.0	97.4	93.6	100.0	96.5

Notes: (1) Percentages in italics are based on less than 30 admissions.

(2) In no instance are the differences between the three groups statistically significant.

MEASUREMENT OF HOSPITAL CARE

The data of this study provide the following yardsticks by which the hospital care required by a patient can be measured. The very nature of this statistical study of hospital admissions imposes an important restriction, namely, that the yardsticks are, with two exceptions, quantitative. Because of the many difficulties which arise when the comparison of therapeutic procedures is attempted from statistical records alone, it was decided deliberately to omit details about treatment. The mental hospitals to which these patients were admitted were therapeutically active, and, as far as can be judged without intensive study, followed a mental hospital routine not very different from the usual pattern in this country. The survey related to the period 1947 to 1951 when most of the current procedures were already routinely adopted in the mental hospitals. Unless, and the contingency is very unlikely, there was any therapeutic differentiation between married and single persons it can be said that these quantitative yardsticks measure not only the amount of hospital care required and provided but also to a certain extent the prognosis of the disorders for single and married persons, for it has been shown by Harris *et al.* (in preparation) that the outcome determined clinically at the end of five years is very highly correlated with the duration of stay in hospital.

The yardsticks used were:

(1) The agency by which the patient entered hospital. This is important since an admission direct to the mental hospital without passing through an observation ward indicates on the whole that the patient has already received some out-patient care. It may also be true to a much lesser extent of the transfers from observation units.

(2) The legal status of the patient on admission. This is associated to some degree with (1) since the proportion of voluntary patients was found to be higher among "direct" admissions than among those transferred from observation units. The social relationships of single and married persons are very different and these may affect the attitude towards certification.

(3) The duration of the survey admission and the proportion of persons discharged after specified periods of time. This is a straight measure of the amount of hospital care.

(4) The result of the survey admission—whether it ended in discharge, with or against medical advice, or in death or whether the patient remained in for the whole of the follow-up period.

(5) Since the termination of hospital care is not necessarily a wholly medical problem it is necessary to take account of re-admissions since an early discharge, for whatever reason, may be followed by an early re-admission. In this connection it should be stressed that the number of re-admissions counted will be less than the true number because the follow-up was not complete for every person.

(6) In association with (5) it is useful to show the total duration of stay, including all periods in mental hospitals during the follow-up period. This measure is subject to the same errors as (5).

(7) The state of the patient at the end of follow-up: whether he is known to be dead, alive, in hospital or out of hospital, or whether, in the absence of any evidence to the contrary, he is presumed alive and out of hospital.

In view of the incomplete follow-up, objections can be raised against the three last-mentioned measures. In their defence it can be recalled that there is some evidence that the length of stay in hospital highly correlates with the general well-being of the patient after a period of years. A more important potential source of error is that there may be differences

between single and married persons with respect to the adequacy of the follow-up. On *a priori* grounds it can be postulated that single persons are more difficult to follow-up than married persons. A single person can change his/her marital status after discharge from hospital and he/she may be unwilling to disclose to his/her spouse the fact that he/she had recently been in hospital. Thus a single person may be less likely to keep in touch with the mental hospital. In the case of a single woman, the change of name on marriage sometimes complicates the follow-up since a patient may not, even on re-admission, admit to a previous mental hospital admission under another name. On the other hand, there seems to be no *prima facie* case why the hospital records of married persons should be less complete than those of single persons. On the whole, therefore, an incomplete follow-up study is likely to underestimate the amount of care received by single persons relative to that required by married persons.

DIAGNOSTIC DISTRIBUTION BY SEX, AGE AND MARITAL STATE

Within each of the decennial age-groups in the age limits from 20–79 years there were marked differences in the relative distribution of diagnostic groups in the groups of single and married patients. This reflects the fact that the single/married (S/M) ratios of first admission rates are not the same for each diagnosis or indeed not the same for any single diagnosis at different ages. In Table IV, in each age group, the disorders accounting for at least 10 per cent. of the admissions (all admissions, not only first admissions) are listed in order of relative importance. The most striking fact to emerge is the preponderance of the two major psychoses, schizophrenia and manic depressive psychosis, in the case of men in all age groups under 60 years of age and in women under 70 years of age. Among single men and women under 50 years of age, schizophrenia is of marked importance; among married persons, schizophrenia declines relatively to manic depressive psychosis from the age of 40 and over for men and from 30 years and over for women. In no age group among single persons does the group of psychoneuroses contribute as much as 10 per cent. of all admissions, but among married men the group of psychoneuroses is listed in the three decennial age groups between 20 and 49 years; among married women the group of psychoneuroses occurs only once in the age group 30–39 years. For married men in the age groups 40–49 and 50–59 years, general paralysis accounts for at least 10 per cent. of all admissions, but this disorder is not of importance in any other group. The differences between married and single persons in respect of diagnostic distribution within the age groups under 50 years of age are highly significant ($P < .001$) but diminish with age and are not significant (that is, $P > .02$) after that age.

COMPARISON OF SINGLE AND MARRIED PERSONS WITH REGARD TO THE AMOUNT OF HOSPITAL CARE REQUIRED FOR MENTAL DISORDERS

The results presented here compare the amount of hospital care received by single persons with that received by married persons. To eliminate possible effects due to sex, age or diagnosis the data have been tabulated in about 350 tables. It is clearly impossible to publish in this paper all of the tables on which the conclusions are drawn. I therefore propose to include only a few tables as samples of the complete set and to discuss, where they exist, the differences exhibited by the various sub-groups in respect of the hospital care of single and of married persons.

The Agency by which Patients entered the Mental Hospitals

The proportion of persons entering the mental hospitals after a period in an observation unit was high for reasons discussed earlier. On the whole, with two exceptions, there was no difference between married and single persons on

TABLE IV

Relative Importance of Disorders Accounting for at Least Ten Per cent. of the Total Admissions in Each Age Group

(Arranged in Descending Order of Importance)

(With percentage contribution of each disorder to total in age group in brackets)

Men		
Age Group	Single	Married
20-29 years	Schizophrenia (69) Manic depressive psychosis (11)	Schizophrenia (44) Manic depressive psychosis (23) Psychoneuroses (15)
Total No. admissions	624	82
30-39 years	Schizophrenia (60) Manic depressive psychosis (15)	Schizophrenia (38) Manic depressive psychosis (29) Psychoneuroses (15)
Total No. admissions	391	263
40-49 years	Schizophrenia (41) Manic depressive psychosis (28)	Manic depressive psychosis (32) Schizophrenia (21) General paralysis (15) Psychoneuroses (13)
Total No. admissions	227	290
50-59 years	Manic depressive psychosis (32) Schizophrenia (16)	Manic depressive psychosis (45) Schizophrenia (12) General paralysis (10)
Total No. admissions	114	266
60-69 years	Manic depressive psychosis (23) Cerebrovascular psychosis (18) Senile psychosis (15)	Manic depressive psychosis (32) Cerebrovascular psychosis (20)
Total No. admissions	96	309
70-79 years	Senile psychosis (41) Confusional psychosis N.O.S. (16)	Senile psychosis (33) Confusional psychosis N.O.S. (12) Cerebrovascular psychosis (10)
Total No. admissions	61	236
Women		
20-29 years	Schizophrenia (60) Manic depressive psychosis (22)	Schizophrenia (35) Manic depressive psychosis (32)
Total No. admissions	348	203
30-39 years	Schizophrenia (51) Manic depressive psychosis (24)	Manic depressive psychosis (41) Schizophrenia (32) Psychoneuroses (10)
Total No. admissions	289	411
40-49 years	Schizophrenia (38) Manic depressive psychosis (36)	Manic depressive psychosis (51) Schizophrenia (25)
Total No. admissions	276	390
50-59 years	Manic depressive psychosis (46) Schizophrenia (27)	Manic depressive psychosis (49) Schizophrenia (19)
Total No. admissions	222	333
60-69 years	Manic depressive psychosis (40) Schizophrenia (17) Senile psychosis (10)	Manic depressive psychosis (46) Cerebrovascular psychosis (12)
Total No. admissions	176	288
70-79 years	Senile psychosis (56)	Senile psychosis (50) Manic depressive psychosis (16) Confusional psychosis N.O.S. (10)
Total No. admissions	124	148

this point. But among all single men entering mental hospital with a diagnosis of manic depressive psychosis 85 per cent came *viâ* an observation unit and the proportion among married men was only 74 per cent. This difference is highly significant ($P=0.001$); in each of the four decennial age groups between 20-59 years a similar difference was elicited. This may reflect the fact that suicide is more common among single than married persons (Dubin *et al.*, 1933). In

the older age groups no such difference appeared. Apart from this instance, in all other age and diagnostic groups there were no differences between the percentage of single and married persons transferred from observation units.

TABLE V

Agency by Which Persons Entered the Mental Hospitals, Showing Percentage Distribution by Marital State, Sex and Diagnosis

Diagnosis			Per cent. Transferred from Observation Units		Total Number of Admissions	
			Single	Married	Single	Married
Schizophrenia	M	..	78.4	76.5	777	230
	F	..	77.0	81.2	522	362
Manic depressive psychosis	M(1)	..	85.0	73.6	246	405
	F	..	74.0	69.3	416	726
Senile psychosis	M	..	89.4	85.7	47	126
	F	..	82.1	76.2	134	126
Psychoneurosis	M	..	52.2	47.2	67	89
	F	..	46.5	42.2	43	71

Note: (1) Chi Square=11.6; d.f.=1; $P=0.001$.

Differences in other groups are not statistically significant.

Legal Status of Patients on Admission

Among men and women admitted with schizophrenia, psychoneuroses and men with senile psychosis there were no differences between the single and married populations with respect to legal status. Among single persons with manic depressive psychosis, both men and women, there were significantly higher proportions of certified persons than among married persons. Among women with senile psychoses there were significant differences between single and married women; these were chiefly due to a much higher proportion of single than married women being admitted under "Form A", a non-statutory admission order to a special geriatric mental hospital in London, and a higher proportion of married than single women being certified. This difference among elderly women can be explained by the fact that a higher proportion of single women (49 per cent.) than married (31 per cent.) were admitted to the geriatric hospital where "Form A" is valid. If the admissions to other ordinary mental hospitals only are considered, there is no significant difference between the proportion (91 per cent.) of single women certified and that of married women (86 per cent.). All but 3 out of 65 single women and 9 out of 87 married women admitted to the geriatric hospital were admitted under the "Form A".

The observation that single persons with manic depressive psychosis are more frequently certified than married persons may possibly be due to a higher suicide risk among single persons so that certification is required in the interests of the patients.

Duration of Stay of Survey Admission

A glance at the accompanying diagrams (Figs. 1-4) suffices to show that there are marked differences between single and married with respect to the duration of the survey admissions. There is a markedly lower proportion of single than of married persons staying in hospital for less than three months

TABLE VI

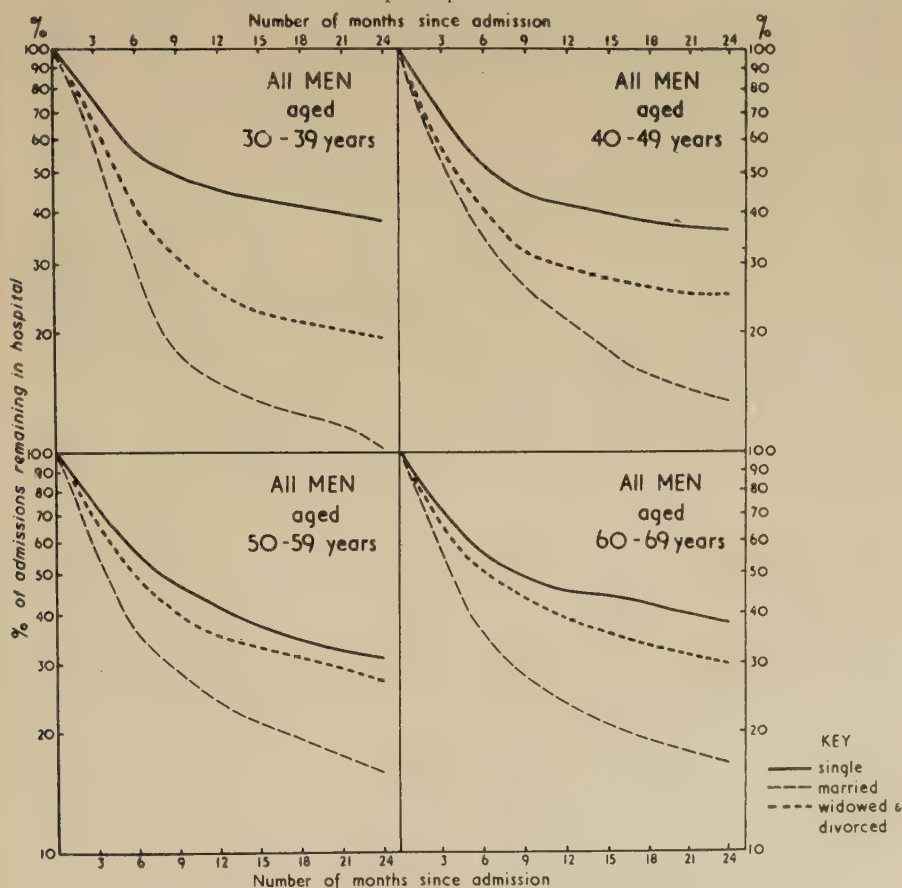
Proportions of Persons Admitted to Mental Hospitals Under Certificate by Marital State, Sex and Diagnosis

Diagnosis			Per cent. of Certified Admissions		Total Number of Admissions	
			Single	Married	Single	Married
Schizophrenia	M	..	74.8	73.0	777	230
	F	..	78.5	80.6	522	362
Manic depressive psychosis	M (1)	..	59.8	45.4	246	405
	F (1)	..	60.3	50.6	416	726
Senile psychosis	M	..	42.6	33.3	47	126
	F (2)	..	49.2	66.7	134	126
	F (3)	..	91.3	86.2	69	87
Psychoneurosis	M	..	4.5	5.6	67	89
	F	..	16.3	8.4	43	71

Notes: (1) Difference highly significant ($P < .01$).

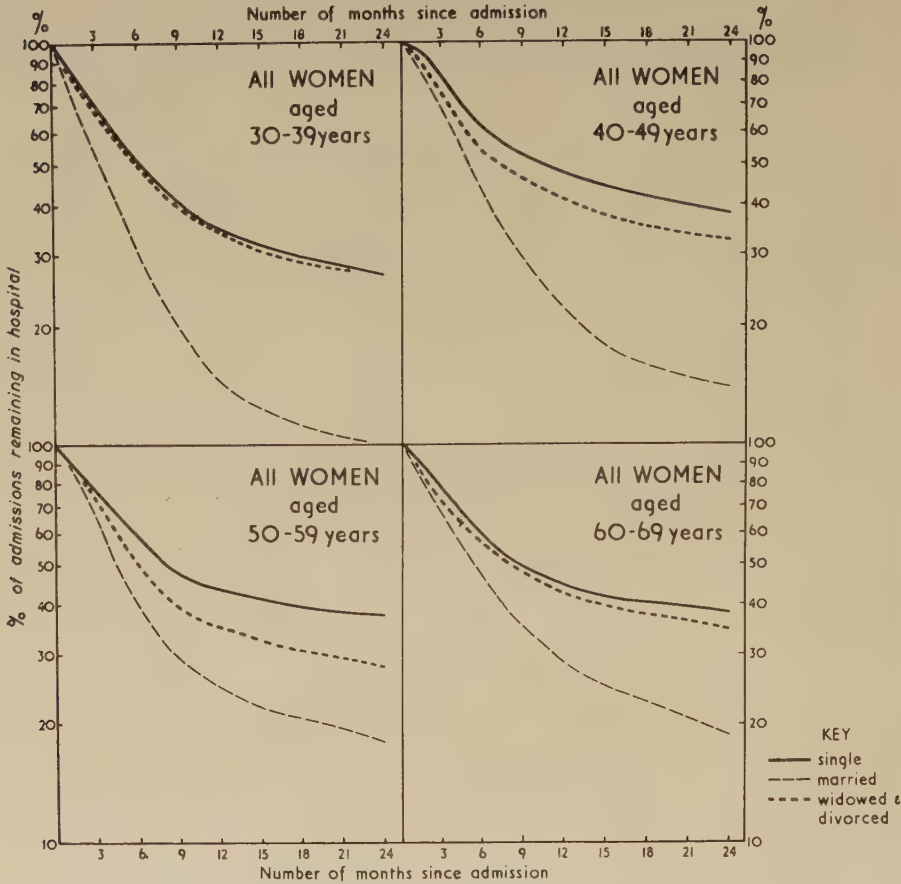
(2) Admissions to all mental hospitals including geriatric hospital.

(3) Excludes admissions to geriatric mental hospital, a large proportion of whom are admitted under a special provision "Form A".



PROPORTIONS OF SINGLE, MARRIED & WIDOWED
PERSONS REMAINING IN MENTAL HOSPITAL
AFTER STATED INTERVALS OF TIME

FIG. 1



PROPORTIONS OF SINGLE, MARRIED & WIDOWED PERSONS REMAINING IN MENTAL HOSPITAL AFTER STATED INTERVALS OF TIME

FIG. 2

and the converse is true of the proportions staying continuously in hospital for at least 2 years, and these differences are highly significant.

By the end of 3 months, 16 per cent. of single men with schizophrenia and 26 per cent. of married men had been discharged. The comparable figures for women were 10 per cent. and 23 per cent. Thirty-nine per cent. of single men with manic depressive psychosis and 47 per cent. of married men were discharged within 3 months; for women the figures were 32 and 46 per cent. single and married respectively. Among psychoneurotics, 56 per cent. of single and 68 per cent. of married men, and, among women, 42 per cent. of single and 66 per cent. of married were discharged within 3 months. These differences are all highly significant ($P < .01$). Similar differences were found in each of the diverse diagnostic and age groups. The extent of the difference between married and single persons in this respect is so great that in some age groups the proportion of married persons remaining in hospital continuously for at least two years with schizophrenia is no greater than that of single persons with manic depressive psychosis.

TABLE VIIA

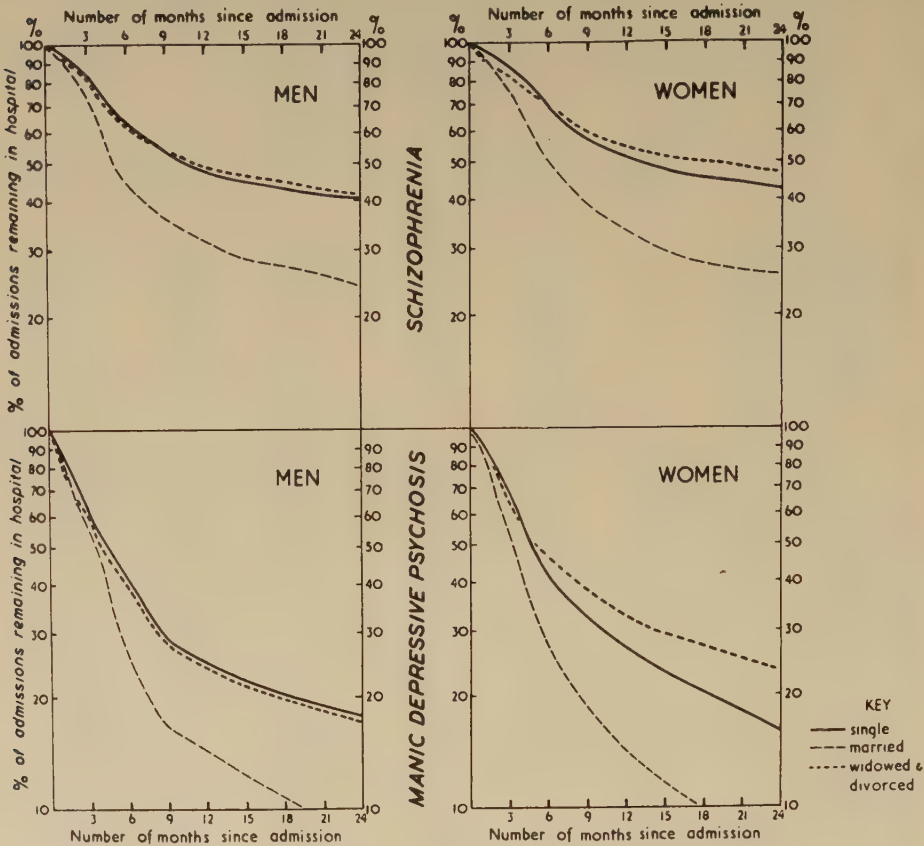
Showing Per cent. of Persons Remaining in Hospital After Stated Intervals of Time (x). By Sex and Marital Status for Selected Age Groups. All Psychiatric Disorders Together

Interval of Time After Admission (x)	Per cent. of Persons Remaining in Hospital					
	Men			Women		
	Single	Married	Others	Single	Married	Others
Number of Admissions aged 30-39 years	391 =100.0%	263 =100.0%	72 =100.0%	289 =100.0%	411 =100.0%	95 =100.0%
2 weeks after admission	93.1	93.5	93.1	96.5	93.4	93.7
4 weeks after admission	90.0	87.1	87.5	91.3	87.3	86.3
8 weeks after admission	81.1	73.0	75.0	84.4	69.8	77.9
3 months after admission	72.9	57.4	63.9	72.3	55.5	68.4
6 months after admission	54.7	27.4	38.9	51.9	31.9	51.6
9 months after admission	50.6	17.5	33.3	41.2	21.2	40.0
12 months after admission	46.3	14.8	25.0	36.0	15.8	35.8
15 months after admission	43.0	13.3	22.2	32.9	12.4	31.6
18 months after admission	40.9	11.8	22.2	31.5	11.2	29.5
2 years after admission	37.9	10.3	19.4	27.7	9.7	27.4
Number of Admissions Aged 40-49 Years	227 =100.0%	290 =100.0%	72 =100.0%	276 =100.0%	390 =100.0%	163 =100.0%
2 weeks after admission	93.8	91.0	90.3	98.2	94.4	95.1
4 weeks after admission	90.3	83.8	79.2	96.4	88.2	89.6
8 weeks after admission	82.4	70.0	68.1	92.0	77.4	76.1
3 months after admission	70.5	55.9	56.9	79.7	66.3	66.3
6 months after admission	51.5	35.5	41.7	60.1	35.9	52.8
9 months after admission	44.5	26.6	31.9	51.4	27.7	46.0
12 months after admission	41.4	21.7	30.6	48.2	22.1	40.5
15 months after admission	39.2	18.3	27.8	43.5	17.2	36.8
18 months after admission	37.4	15.5	26.4	41.3	16.2	35.6
2 years after admission	35.7	13.4	25.0	37.3	13.6	33.1
Number of Admissions Aged 50-59 Years	114 =100.0%	266 =100.0%	79 =100.0%	222 =100.0%	333 =100.0%	188 =100.0%
2 weeks after admission	92.1	93.2	94.9	96.4	96.1	95.2
4 weeks after admission	88.6	85.7	92.4	92.8	91.6	89.9
8 weeks after admission	83.3	67.3	82.3	85.6	79.9	83.0
3 months after admission	75.4	56.8	67.1	78.4	66.1	72.3
6 months after admission	56.1	35.3	49.4	58.6	38.7	52.1
9 months after admission	47.4	28.9	38.0	48.2	28.8	44.1
12 months after admission	43.0	24.1	36.7	45.9	25.2	39.9
15 months after admission	36.8	20.7	35.4	42.8	22.2	38.8
18 months after admission	36.0	19.5	34.2	39.6	20.7	36.2
2 years after admission	30.7	15.8	26.6	37.8	18.0	34.0
Number of Admissions Aged 60-69 Years	96 =100.0%	309 =100.0%	118 =100.0%	176 =100.0%	288 =100.0%	306 =100.0%
2 weeks after admission	94.8	92.6	97.5	98.9	94.4	96.4
4 weeks after admission	91.7	86.7	90.7	96.0	88.9	92.5
8 weeks after admission	83.3	75.7	76.3	89.2	77.4	81.7
3 months after admission	76.0	59.5	66.1	80.1	68.1	72.2
6 months after admission	57.3	36.9	52.5	58.0	41.7	56.9
9 months after admission	49.0	27.5	45.8	48.9	34.0	49.0
12 months after admission	45.8	24.6	39.8	44.3	27.4	41.8
15 months after admission	44.8	21.4	36.4	42.0	25.0	39.2
18 months after admission	42.7	19.4	33.9	40.3	23.6	38.6
2 years after admission	38.5	16.8	29.7	37.5	19.1	33.7

Termination of Survey Admission

The ways by which the survey admission could be terminated were classified as follows: (1) discharge with medical consent; (2) leaving hospital against medical advice; (3) terminated only by the end of the follow-up on 31 December, 1951 because the patient remained in a mental hospital continuously, either in the same hospital or after transfer to another mental hospital; (4) by death in a mental hospital without ever having been discharged from the survey admission; (5) repatriation in the case of aliens, colonials or members of the dominions.

The results can be summarized briefly. Relatively fewer single than married persons leave hospital. This is so in practically every sex, age and diagnostic group. When the age groups within the various diagnostic groups are aggregated the differences between single and married groups are highly significant ($P < .01$)



PROPORTIONS OF SINGLE, MARRIED & WIDOWED PERSONS REMAINING IN MENTAL HOSPITAL AFTER STATED INTERVALS OF TIME

FIG. 3

TABLE VIIIb

Showing Per cent. of Persons Remaining in Hospital After Stated Intervals of Time (x). By Sex and Marital Status for Selected Age and Diagnostic Groups

Interval of Time After Admission (x)	Per cent. of Persons Remaining in Hospital					
	Men			Women		
	Single	Married	Others	Single	Married	Others
Schizophrenia						
Number of Admissions	236	100	32	148	131	42
Aged 30-39 Years	=100.0%	=100.0%	=100.0%	=100.0%	=100.0%	=100.0%
2 weeks after admission	95.3	97.0	96.9	98.6	96.9	93.1
4 weeks after admission	93.2	92.0	96.9	95.9	93.1	88.3
8 weeks after admission	88.1	87.0	90.7	92.5	83.2	81.1
3 months after admission	82.2	73.0	84.5	84.4	75.6	78.7
6 months after admission	66.1	33.0	50.1	63.5	49.6	66.8
9 months after admission	61.0	21.0	47.0	54.0	39.7	50.1
12 months after admission	56.3	16.0	40.8	47.9	31.3	45.3
15 months after admission	53.3	15.0	37.7	44.5	27.5	40.5
18 months after admission	51.2	14.0	37.7	43.8	26.0	40.5
2 years after admission	47.4	13.0	34.5	40.4	24.5	38.1
Manic Depressive Psychosis						
Number of Admissions	36	119	31	102	164	87
Aged 50-59 Years	=100.0%	=100.0%	=100.0%	=100.0%	=100.0%	=100.0%
2 weeks after admission	86.1	95.0	93.6	97.1	97.6	96.2
4 weeks after admission	83.3	88.3	90.3	90.3	91.5	88.2
8 weeks after admission	77.7	65.6	80.6	79.5	78.1	82.5
3 months after admission	66.6	51.3	61.3	68.7	62.2	67.6
6 months after admission	49.9	26.1	38.7	41.2	30.5	46.9
9 months after admission	41.6	21.1	22.6	27.5	22.0	36.6
12 months after admission	38.8	16.1	22.6	24.6	19.0	33.2
15 months after admission	38.8	16.1	22.6	21.7	16.0	32.1
18 months after admission	36.0	14.1	22.6	17.8	13.6	28.7
2 years after admission	30.4	11.9	19.4	15.8	9.9	26.4

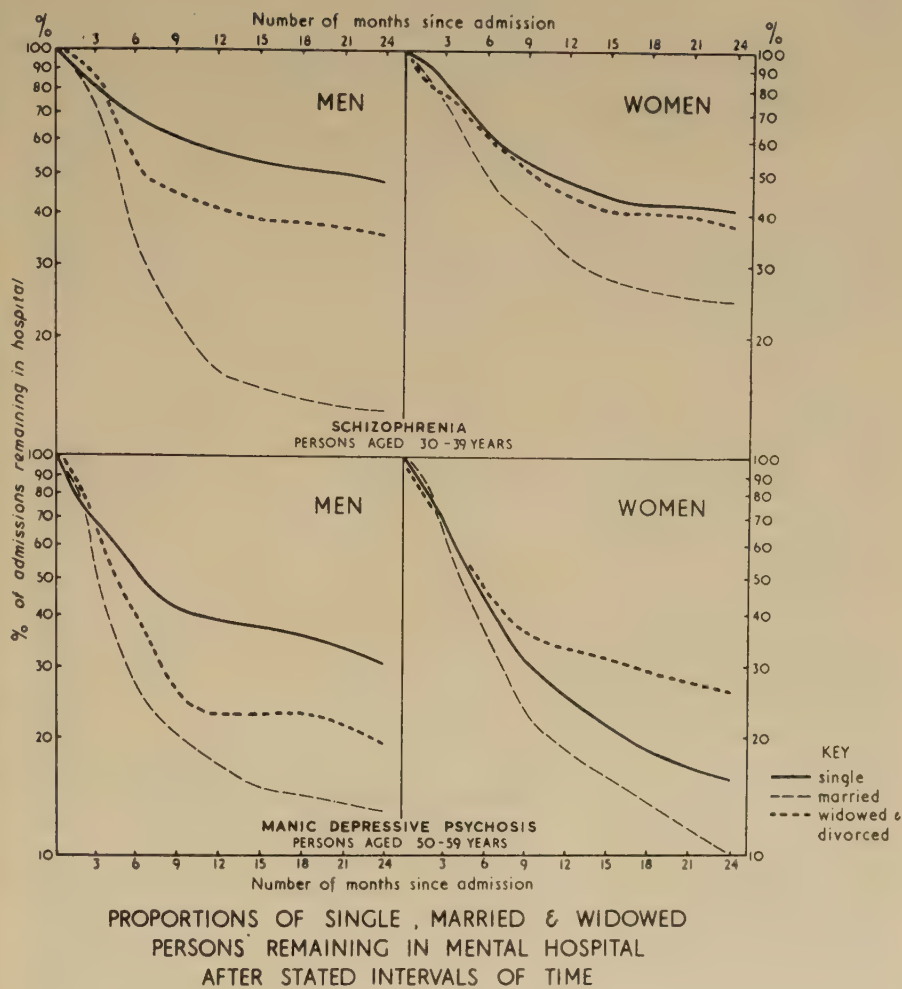


FIG. 4

for schizophrenia, manic depressive reaction and for men with senile psychosis. On the whole, the differences between single and married in the proportions leaving against advice are not significantly different in spite of the fact that among the groups of single persons with manic depressive psychosis there is a higher proportion of certified patients than in the comparable group of married patients. It is of course considerably easier for voluntary patients to leave against advice than it is for certified patients so that a higher proportion of married than single persons leaving against advice would not have been unexpected. There is a striking similarity between the outcome for men and that for women within the same marital state groups.

Number of Re-admissions During the Follow-up Period

It has been shown in a previous paragraph that there were no significant differences between single and married persons in respect of date of admission; in each trimester during 1947-49 the proportions of single and married were approximately the same so that the potential follow-up periods for single and

TABLE VIII

Percentage Distribution of Admissions by Termination of Survey Admission

Diagnosis and Mode of Termination	Single		Married	
	Men Per cent.	Women Per cent.	Men Per cent.	Women Per cent.
<i>Schizophrenia:</i>				
(1) Discharge with consent ..	45.3	45.8	57.4	63.8
(2) Left against advice ..	13.5	10.0	16.1	12.4
(3) Remaining in until 31.12.51	36.3	39.1	21.3	21.8
(4) Death in mental hospital ..	2.3	2.9	3.0	1.4
(5) Other	2.6	2.2	2.2	0.6
Number of admissions ..	777	522	230	362
<i>Manic depressive psychosis:</i>				
(1) Discharge with consent ..	64.2	68.8	75.8	78.6
(2) Left against advice ..	10.2	8.7	10.1	11.6
(3) Remaining in until 31.12.51	15.4	14.7	5.7	4.8
(4) Death in mental hospital ..	6.1	7.9	6.7	5.0
(5) Other	4.1	—	1.7	—
Number of admissions ..	246	416	405	726
<i>Senile psychosis:</i>				
(1) Discharge with consent ..	10.7	9.0	17.5	10.3
(2) Left against advice ..	—	—	4.8	3.2
(3) Remaining in until 31.12.51	29.8	38.0	11.9	27.8
(4) Death in mental hospital ..	59.5	53.0	65.0	58.7
(5) Other	—	—	0.8	—
Number of admissions ..	47	134	126	126
<i>Psychoneuroses:</i>				
(1) Discharge with consent ..	67.1	72.0	79.8	76.0
(2) Left against advice ..	25.4	14.0	20.2	22.5
(3) Remaining in until 31.12.51	7.5	7.0	—	1.5
(4) Death in mental hospital ..	—	7.0	—	—
(5) Other	—	—	—	—
Number of admissions ..	67	43	89	71

married are the same. This permits of a comparison between single and married with respect to the number of admissions during the follow-up period.

There were no significant differences between single and married persons with regard to the frequency of re-admissions. The proportion of discharged persons with schizophrenia who were never re-admitted during the follow-up varied between 62 per cent. for single men and 67 per cent. for married women. Among manic depressives the proportion varied between 74 per cent. in single men and 66 per cent. in married women, and for psychoneurotics between 66 per cent. for single women and 79 per cent. for married women. There are no consistent or significant differences between men and women of the same marital state group (see Table IX).

Total Period Spent in Hospital During Follow-up Period

When single and married persons of either sex are compared with respect to the total duration of stay in hospital during the follow-up period it is found

TABLE IX

Percentage Distribution of Discharges by Number of Re-admissions During the Follow-up Period

Diagnosis and Number of Re-admissions	Single		Married	
	Men Per cent.	Women Per cent.	Men Per cent.	Women Per cent.
<i>Schizophrenia:</i>				
No re-admissions	61.9	64.7	65.2	67.2
1 re-admission	26.6	25.9	22.5	23.1
2 re-admissions	7.8	7.2	7.3	6.9
3 or more re-admissions ..	3.6	2.2	5.0	2.8
Total No. Persons discharged	523	363	178	290
<i>Manic depressive reactive psychosis:</i>				
No re-admissions	73.9	69.6	72.8	66.0
1 re-admission	19.2	16.8	17.4	19.5
2 re-admissions	4.9	9.2	5.3	8.0
3 or more re-admissions ..	2.0	4.3	4.5	6.4
Total No. Persons discharged	203	346	379	686
<i>Psychoneuroses:</i>				
No re-admissions	73.0	66.1	70.9	78.7
1 re-admission	17.6	22.6	22.2	13.8
2 re-admissions	2.7	4.8	3.4	6.4
3 or more re-admissions ..	6.7	6.5	3.4	1.1
Total No. Persons discharged	74	62	117	94

that there are significantly higher proportions of married than single persons whose total hospital experience is not more than 6 months and, conversely, lower proportions of married than single whose total stay is at least 2 years in duration. It has been shown that the duration of the survey admission was very much less for married than single persons and this advantage of the married group was not offset either by an increase in the frequency or of the duration of the re-admissions.

Widowed and Divorced Persons

The greater part of this paper has been restricted to a comparison between single and married persons only. Widowed and divorced persons are of interest in this context because they combine to a certain extent some of the experiences of the other two groups. They have been married so that they have demonstrated that whatever defects there may be in their personalities such defects have not constituted a bar to marriage. On the other hand, widowed and divorced persons are usually living without the constant companionship of a person of the same generation. They may have families of their own so that in many respects the problems dealt with by this class of people will be more akin to those of married than to those of single persons.

The first admission rates for widowed and divorced persons occupy a position between those for single and married persons but rather nearer the latter than the former. This has been found by several investigators including Malzberg (1940), Ødegaard (1946) and Norris (in preparation) in the various studies mentioned earlier in this paper. The total number of widowed and divorced persons in this study was 1,992 (619 men and 1,373 women) and this number was not large enough to permit of such a detailed breakdown as in the

case of single and married persons because over three-quarters of the widowed and divorced were over 50 years of age. On the other hand, as prognosis depends on age as well as diagnosis, it is not satisfactory to group all ages together unless it is clear that in every age group the group of widowed and divorced persons (as the latter constitute a very small proportion in this group, the group will hereafter be called widowed) occupies the same position in relation to single and married persons. In regard to the amount of hospital care, widowed persons do not consistently occupy the intermediate position which they hold for first admission rates. However, in those age and diagnostic groups in which there are at least 20 persons of each marital status there is a definite tendency for the widowed group to stand between the extremes of the single and married groups (Table X).

TABLE X

Percentage of Persons Staying in Hospital Continuously for at Least 2 Years for Sub-groups Having at Least 20 Persons (with One Exception) in Each Marital Status Group

Sex and Diagnosis	Age Group	Percentage of Persons Staying at Least 2 Years				Total Number of Persons in Sub-groups			
		Single	Married	Widowed and Divorced	All	Single	Married	Widowed and Divorced	All
<i>Men:</i>									
Schizophrenia	30-39	47.5	13.0	34.4	37.0	236	100	32	368
Manic depressive	50-59	30.6	11.8	20.0	16.7	36	119	31	186
	60-69	27.3	14.0	25.8	18.3	22	100	31	153
Senile psychosis	70-79	36.0	21.8	32.2	27.8	25	78	59	162
<i>Women:</i>									
Schizophrenia	30-39	40.5	24.4	38.1	33.6	148	131	42	321
	40-49	53.8	26.8	50.0	42.4	106	97	40	243
	50-59	71.2	35.5	42.1	50.3	59	62	38	159
Manic depressive	30-39	7.2	2.4	16.1	5.2	69	168	31	268
	40-49	26.5	7.1	22.9	15.3	98	198	70	366
	50-59	15.7	9.8	26.4	15.6	102	164	87	353
	60-69	22.5	13.7	21.1	18.4	71	131	114	316
Senile psychosis	60-69	61.1	40.7	50.0	49.5	18	27	56	101
	70-79	49.3	44.6	47.7	47.3	69	74	214	357
	80 and over	46.8	28.0	40.1	40.2	47	25	142	214

The figures (1-4) show the necessity for examining the relationship between marital status and duration of stay in hospital for groups standardized by age and sex. In Figures 1 and 2 where the admissions are classified by age, sex and marital status alone, Figure 1 relating to men shows that the widowed occupy an intermediate position between married and single persons whereas in Figure 2, relating to women, in two age groups, 30-39 and 60-69 years, the widowed curves are almost identical with those for single persons. In Figure 3, where the curves for schizophrenics and manic depressives (all ages combined) are shown, it can be seen that the curves for widowed men are practically the same as those for single men, whereas the curves for widowed women indicate that their prognosis is worse than that of single women. In Figure 4, the curves have been drawn for schizophrenics aged 30-39 years and manic depressives aged 50-59 years. Here it can be seen that, among men, the widowed occupy a position intermediate between the married and single for both psychiatric disorders. Among women, this tendency is much less marked and widowed persons fare no better, and even worse in some instances, than single women.

DISCUSSION

The diverse yardsticks used to measure the amount of hospital care required by single and married persons show that married persons experience appreciably less hospital care than single persons. The advantage of married persons in this

respect is found in each age and diagnostic group and for both men and women, but it is particularly marked for the major psychoses, schizophrenia and manic depressive psychosis. The differences between single and married are so large that in an investigation into the possible efficacy of a new therapy it would clearly be necessary to ensure that married and single were equally represented in the treatment and control groups. In a study of the factors influencing the discharge of female patients Orr *et al.*, found that married women with or without living children and widowed women with living children were more likely to be discharged from hospital than either widowed women with no living children or single women.

From a statistical enquiry such as this it is not possible to examine the reasons for the difference between married and single persons. Taken in conjunction with the higher expectation for single persons of requiring hospital admission, the findings of this analysis of hospital data do suggest that further investigation into the effect of marriage on the development and progress of mental disorder might be profitable. Ødegaard (1946) enumerated three postulates in connection with the higher admission rates of single over married persons. Briefly these were:

- (i) that a single person might be more readily admitted than a married person;
 - (ii) that potential mental patients show constitutional traits which are a deterrent to marriage;
 - (iii) that in married life certain factors obtain which may prevent the development of mental disease even if there exists a "constitutional predisposition".
- Of these, Ødegaard favoured the second hypothesis. The present data could support one or all of these hypotheses.

If single persons are more readily admitted to hospital than are married persons this is presumably due to socio-economic factors which make it more difficult for a married than a single person to enter hospital in the first instance and more difficult for him or her to remain in hospital, and, conversely, more difficult for a single person to stay out of hospital. On the whole the family responsibilities of single are less than those of married persons. Obviously, the admission to a mental hospital of the father, who is usually the chief wage-earner, is an economic disaster for a family, but if there are young children then the expense of a substitute for a mother who is admitted is also a drag on the family's financial resources. There is thus a strong financial incentive for married persons to keep out of hospital as long as possible and, if admission is unavoidable, to stay in hospital for as short a time as possible. On the other hand, as far as single people are concerned, if they are not living with their parents or relatives, their psychiatric abnormalities will be less readily tolerated by the households in which they live so that they are likely to be admitted earlier. For the same reason they may possibly stay in hospital longer.

The fact that married persons are not re-admitted more frequently than single persons and that the total time spent in hospital over a period of years is less than that for single persons does not support the argument which might be advanced that married people are discharged too early on account of economic liabilities. If that were so one would expect to find a higher proportion of relapses among married than among single persons, and this is not the case. It would be interesting to compare groups of single and married persons all of whom had major responsibilities for one or more dependants, to see whether or not the single group would still have longer hospital in-patient care than does the married, and also to compare the hospital care of childless married couples with that of married persons with dependant families.

The economic consequences on the family of hospital admissions are possibly greater when the husband is admitted than when the wife is admitted. If economic factors are of predominant importance in relation to hospital care then it is possible that married men may be admitted less frequently and for shorter periods than married women. From the data of the main survey I have calculated first admission rates, all disorders together, by marital status (*op. cit.*). For married men and women these are shown in Table XI.

TABLE XI

First Admission Rates per Million Married Persons in General Population

Age Group	Married Men (R_M)	Married Women (R_W)	Difference $\pm$ Standard Error ($R_W - R_M$) $\pm$ S.E.	Probability P
16-29 years	191 $\pm$ 58	340 $\pm$ 63	149 $\pm$ 85	$P > .05$
30-49 years	298 $\pm$ 38	536 $\pm$ 52	238 $\pm$ 64	$P < .001$
50-69 years	575 $\pm$ 68	734 $\pm$ 80	159 $\pm$ 105	$P > .05$

In the age group 30-49 years married men are admitted relatively less frequently than married women. When the rates for diverse diagnoses are considered (Table XII) it can be seen that the significant excess of married women over married men is confined to the diagnostic group of manic depressive psychosis (this group includes all depressive states, manic and cyclical manic depressive psychoses).

TABLE XII

First Admission Rates per Million Married Persons Aged 30-49 Years

Diagnostic Group	First Admission Rates Men = R_M	Women = R_W	Difference ($R_W - R_M$) $\pm$ S.E.	Probability P
Schizophrenia	79 $\pm$ 19	153 $\pm$ 28	74 $\pm$ 34	$P < .05$
Manic depressive psychosis ..	75 $\pm$ 19	208 $\pm$ 32	133 $\pm$ 36	$P < .001$
Other disorders	140 $\pm$ 26	165 $\pm$ 29	25 $\pm$ 39	$P > .05$
All disorders*	298 $\pm$ 38	536 $\pm$ 52	238 $\pm$ 64	$P < .001$

* Includes a few cases of senile psychoses not shown separately in the table.

In each group for each of the three diagnostic groups, schizophrenia, manic depressive psychosis and psychoneuroses, no differences were found between married men and women with respect to length and outcome of the survey admission, or with respect to the total time spent in hospital during the follow-up period. These results may indicate either that it makes little difference to the family's financial resources which of the married partners is admitted to hospital or that economic liability is not an explanation of the relatively short stay in hospital experienced by married persons. In any event, the difference between married and single persons in respect of hospital stay is not likely to be the result of a single cause but rather of a concatenation of circumstances.

On Ødegaard's second postulate it may be argued that markedly abnormal constitutional traits which are severe enough to prevent marriage are themselves

signs of a poor prognosis. In other words, that single persons with mental disorder suffer from more serious forms of illness than married persons. It is not easy to see how such a postulate could be proved, except possibly by a very detailed study of the prognostic importance of a large number of constitutional traits and a comparison of the frequency with which they occur in groups of single and married persons. Finally, it has been postulated that marriage is a protection against mental ill health in that it not only prevents the exhibition of mental disorders in persons who may have a "constitutional predisposition" to it but also that it prevents the development of serious illness even after some disorder has been made manifest.

I should like to put forward a further hypothesis, namely, that marriage plays an important role in protecting the mentally abnormal from the community's reaction to mental illness. On the assumption that most marriages are happy, or at all events, tolerable, it can be argued that, among adults, a married person is more likely than a single person to have at least one person who is sufficiently interested in his/her welfare to take pains to care for them "in sickness and in health". In these days when it is commonly assumed that marital obligations are often lightly cast aside, this argument is encouraging. The fact that widowed persons on the whole also stand in a favourable position *vis-à-vis* single persons may indicate that not only does the married state entail responsibilities for the partners but it usually results in a family, the members of which are ready to help either one of their parents in times of need. To enquire further into this aspect of the problem it would be necessary to make exhaustive study of the family history of mentally ill persons. In particular, the psychiatric aspects of legal separation, divorce, widowhood and childlessness need detailed investigation.

There are no doubt many hypotheses which could be formulated to explain the difference between single and married persons with respect to mental ill health. This study draws attention not only to differences in first admission rates but also to those in the quantity of hospital care received by single and married persons. The influence of marriage on the development and progress of mental disorder has not been extensively investigated although the large differences found between single and married persons in this study suggest that this may be a fruitful line of research.

SUMMARY

A statistical study of some 8,000 admissions to mental hospitals in Greater London has been made with a view to exhibiting differences between single and married persons in respect of hospital care. It was found that the first admission rates of single persons are much higher than those of married persons in similar age, sex and diagnostic categories; for example the age-standardized first admission rate of single men with schizophrenia was 6 times as high as that for married men. The ratios of single to married age-standardized rates for other diagnostic groups of male and female patients varied from 1.5 to 3.7.

The hospital care received by the patients was measured by (a) the duration of the survey admission; (b) the termination of the survey admission; (c) the re-admission rates; (d) the total time spent in hospital over a follow-up period of at least two years; (e) the state of the patient at the end of his/her follow-up. When groups of patients, comparable with respect to previous history, length of follow-up period, legal status, age, sex and diagnosis, were examined according to their marital status, it was found that:

- (i) Single persons stayed in hospital for longer periods than married persons, and in many instances for longer than the groups of widowed and divorced persons;
- (ii) Proportionately more single than married persons were in mental hospitals at the end of the follow-up period;
- (iii) The re-admission rates for single persons who were discharged from their survey admission were not significantly higher than those for married persons;
- (iv) Over the whole follow-up period single persons stayed in mental hospitals for a longer time than married.

(v) The outcome for men showed no significant differences from that for women in the same marital status group. Only among manic depressives aged 30-49 years were the first admission rates for married men significantly less than those for married women. An overall assessment of the results shows that single persons are more likely to enter mental hospitals than married persons, that once in they are less likely to be discharged and that their duration of stay in hospital is longer than that of married persons.

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PERCEPTION OF THE UPRIGHT IN RELATION TO BODY IMAGE

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THE CONCEPT OF THE BODY IMAGE AND THE PERCEPTION OF THE HUMAN BODY

THE consideration of our awareness of our own bodies ceased to be wholly a philosophical problem when Pick (1908) and Head and Holmes (1911), having observed neurological disturbances of body awareness, first suggested the concept of a Body Image or Body Schema. The concept, has in its slow growth, become at times confused and has always resisted satisfactory definition. Pick himself made no attempt to define it, while for Head and Holmes it was a "postural model of the body" being constantly built up and changed by every new posture and movement and forming a "plastic schema" which was "the fundamental standard against which all postural changes are measured". Schilder (1935) greatly enriched the concept by emphasizing not only its physiological and neuropathological basis but its psychological aspect. He defined it thus: "The image of the human body means the picture of our own body which we form in our mind, that is to say the way in which the body appears to ourselves." This was a comprehensive "body image"; more than a perception or mere representation and including even Head and Holmes's "Body Schema". The Body Schema concept has been more recently defined by Clifford Scott (1948) as "that conscious or unconscious integration of sensations, perceptions, conceptions, affects, memories or images of the body from the surface to its depths and from its surfaces to the limits of space and time".

While such formulations as Schilder's and Scott's are valuable for their emphasis on the complexity of the Body Image or Body Schema concept, they provide no satisfactory framework for the ordering of clinical or experimental observations on disturbances of body awareness. There has been loose usage, too, of such terms as "body image", "body schema" and "postural model of the body", which has been criticized by Robertson, quoted by Reitman (1950) and Smythies (1953). Smythies (1953) has put forward some new definitions and thinks that the term "body image" should be used only to describe a visual, mental or memory image of the human body. The "body concept" should, he believes, refer to a constellation of memories we each possess concerning our own physical bodies, while the "body schema" should define the system responsible for posture, automatic movements and the co-ordination of voluntary movement; an activity going on outside our awareness and closely related to the original postural model concept of Head and Holmes. Our awareness of our own bodies as a spatially extended field he describes as the "perceived body". This subdivision of the "body image" concept affords us a new system to which clinical disturbances of body awareness, whether neurological or psychiatric, can be related, although it must remain uncertain how truly distinct body concept, schema and percept are. Schilder (1935), to whose views Smythies does perhaps less than justice, had said "We may draw the general conclusion that one part of the Body Image is nearer to perception and another part nearer to ideas".

This present paper concerns itself with disorders of the Perceived Body in Smythies' sense and it is necessary, therefore, to consider more fully what is meant by this. Smythies defines the Perceived Body as "the spatially extended field present in direct consciousness whose head surrounds the observing self and the rest of which is extended in perceptual space below the observing self". While we remind ourselves that the perceived body is not the same thing as the physical body any more than physical space is the same thing as our perception of space, it is not possible to consider in detail the philosophical aspect of this problem here. That it is, however, of great importance to all thinking on Body Image problems has been appreciated by Hutton (1950), Brain (1951) and Smythies (1953).

It must be recognized that the perceived body, together with our perception of other objects, is coincident in space with neurone activity in the brain. Despite the contrary views of many neurologists, it would seem wrong to consider a "perceived body" as having any fixed cortical "representation"; for the cortex, as Goody and Reinhold (1954) have pointed out, is not the only area concerned with such a qualitative process as perception. Our perceptions of our bodies, as of other objects, are, according to these authors, built up from patterns of impulses yielded by the sense organs and these impulses are transmitted as "waves" to the brain. These impulses, varying in frequency and intensity and having spatial and temporal patterns, are received by the cerebral cortex, which, at an unconscious level, selects, differentiates and integrates them. The site of the mechanism of the whole perceptual process must be accepted as unknown. Other aspects of the Body Percept, too, remain obscure; our perceptions of our bodies, for example, in their development are accompanied by affective states which, in some mysterious way, become localized with other bodily perceptions. At a later stage in development our perceptions become more fully differentiated and associated with conceptual qualities of temporal and spatial location.

THE DISTORTIONS OF THE PERCEIVED BODY

That distortions of body awareness result from both psychological changes and physiological disturbances in the brain was recognized by Charcot (1892) who, demonstrating a patient with an amputated left arm and a phantom limb at the Salpêtrière, remarked that "this probably concerns psychology more than physiology, but . . . the distinction between these two is not as great as some suppose". Among writers on this subject, Schilder has been almost alone in making both neurological and psychopathological studies of Body Image changes. The neurological disturbances of the perceived body, which have a clear basis in neuropathology, have been described by many authors and are classified by Gerstmann (1942) and Critchley (1953). They are mainly agnostic defects and cannot be further considered here.

Psychiatrists have shown less interest in distortions of the perceived body occurring in mental illness and there seem to be several reasons for this. The first, perhaps, is the clinician's lack of awareness of a problem which receives such scant mention in text-books and in schemes of psychiatric examination. The symptoms are not elicited; their significance is not understood or they are obscured by delusional elaboration. Furthermore, the seemingly limited value of such symptoms for either diagnosis or prognosis has not stimulated interest. Patients, as noted by Mayer-Gross (1935) and Shorvon (1946), do not easily verbalize their disturbed feelings of body awareness when questioned; nor do

they always spontaneously complain of these symptoms for they doubtless feel, with Descartes: "How could I deny that these hands and this body are mine, were it not that I compare myself to certain persons devoid of sense . . . But they are mad and I should not be any less insane to follow examples so extravagant."

Lastly, the failure, in spite of repeated attempts, to demonstrate changes in sensory perception related to the symptomatology deprives the psychiatrist of any objective criteria for the classification and examination of these phenomena.

Psychiatric disorders of body perception are described in the Depersonalization and Interparietal Syndromes. In the Depersonalization Syndrome, as Mayer-Gross (1935) pointed out in his classic description, somatic symptoms are not an essential feature although they occur in at least half the cases. The changes in bodily sensations were noted to affect mainly the head and limbs and were occasionally limited to single parts of the body. Nearly half of Mayer-Gross's cases were diagnosed as suffering from endogenous depression. The remaining diagnoses included schizophrenia, hysteria and neurasthenia, while other writers have reported depersonalization in a wide range of organic mental syndromes. The average age of Mayer-Gross's and Shorvon's (1946) cases was about 25 years.

Gurewitsch (1932, 1933) described what he called "The Interparietal Syndrome" in which alterations in the body awareness were found in association with polyopia, dysmegalopsia and dysmorphopsia. The symptoms were found in such diverse conditions as schizophrenia, epilepsy, hysteria, cerebral trauma and cerebral syphilis. L. von Angyal (1934, 1937) described further cases of "interparietal syndrome" as did Andras Angyal (1935, 1936, 1937). These authors did not formulate a distinct clinical picture but were more particularly concerned to demonstrate a relationship between symptoms and a cerebral pathology localized in the parietal lobe. Their reports do, however, from a clinical point of view, serve to draw attention to the similarity of body percept changes occurring in schizophrenic, depressive and organic cases and to the association with changes in vision and appreciation of space.

Psychoanalysts, apart from Schilder, have concerned themselves very little with changed bodily awareness and have been interested rather in depersonalization as a mechanism of ego defence and in metapsychological problems of the relation between the ego and body ego and between the ego and the self (Scott, W. C. M., 1948; Scott, R. D., 1951). Some writers have described changes in the body percept, notably Federn (1926) who made some interesting observations on changes in the magnitude of certain body parts and in feelings of their foreignness which take place in the period of falling asleep or waking. Of particular interest, too, is R. D. Scott's (1951) detailed and unusually comprehensive description of changes in body awareness in a female patient. Scott's patient felt her head split into right and left halves and complained that the two sides of her head and her two eyes did not work together. She sat so that people were on her right side for she feared that what they said would be incomprehensible to her if they were on the left. The whole left side of her body felt dead and clumsy compared with the right. There were also horizontal divisions in the body percept at the level of the neck and solar plexus. She complained of the insubstantiality and unreality of objects in the outside world and felt that there was something wrong with the left side of space. She was always bumping into things on the left side and also felt that there was a void on the left trying to pull everything into it. She had difficulty when trying to hang things up on the left as she made false projections. Perimetry showed that the area of diminished

vision on the left was related not to the visual field but to the central plane of the head. I have made special mention of this case, not only because its description first drew my attention to similar cases, but because these symptoms, although not uncommon, are not, as far as I know, described elsewhere. Norman (1954) in a recent paper has described "body image" changes and other perceptual changes which she observed and inferred in schizophrenic children. She found that these children emphasized loss or damage to the head; that they treated parts of their own bodies as foreign to themselves; were concerned with themes of loss of life, general bodily disintegration and mutilation and showed poor identification with their own sex. She also felt that failure of body image organization was associated with failure in orientation and noted that drawings of people and things were often made upside down, at right angles or at any angle to the conventional one. Norman concludes that these children "fail to integrate their visual, postural and vestibular experience in such a way as to achieve a steady upright orientation in a stable world".

Many studies with Mescaline have shown changes in perception of the body and the appreciation of space and time and are described very clearly by Beringer (1927) and Guttman (1936). Anderson and Rawnsley (1954) have reported similar changes in the "body image" in patients given lysergic acid diethylamide. They note particularly feelings of lightness of the body, feelings that the face or hands had increased in size, diminution of body size or a disintegration of the body percept. The appreciation of time and space was changed. Distortion of perspective was common; the room, in the author's words, appearing "on a slant".

CLINICAL DESCRIPTION OF THE GROUP OF PATIENTS UNDER INVESTIGATION WITH DISTORTIONS OF THE PERCEIVED BODY

A percept, according to Bertrand Russell (1948) "is what happens when, in common sense terms, I see something or hear something or otherwise believe myself to become aware of something through my senses".

In the selection of cases considered to show distortion of body perception, I have tried to assure myself that the patient's complaint was something of which he became aware through the senses; which was not the result of a recognizable disease of the physical body and which was not a mere figure of speech. These distinctions are not easily made, as Schilder (1935) recognized. He said, "It is, of course, very difficult to get from patients descriptions of a kind which would allow a differentiation between what is an actual change in the senses and in the perceptions and representations concerning the postural model of the body and what is a delusion concerning the image of the body." In some cases the opinion that their complaints had a perceptual basis was strengthened by the attitude of physicians and surgeons who had investigated, treated and operated on them without effect before they were referred to the psychiatrist. In other cases the patient's own attitude and "the persistence of symptoms in the face of complete insight into their paradoxical nature" (Mayer-Gross, 1935) has provided support for their inclusion in this group of patients.

The cases were selected regardless of diagnostic category or other clinical features, but all were considered to show a deformity of body perception. The occurrence of disturbances of body awareness is, as noted above, widely recognized in depersonalization, schizophrenia, organic mental states but less commonly in patients with depression, and only Mayer-Gross suggests that the somatic delusions of involutional melancholia may have a perceptual basis.

Sixteen cases, as will be described later, received tests of vertical perception and only these cases, eight males and eight females, are described here. These cases have all been admitted to hospital, but a very great number, perhaps the majority, of patients showing a disturbance of the Body Percept are never admitted to a mental hospital and are more likely to be treated by physicians, surgeons or physiotherapists than a psychiatrist.

Of the eight male patients, six were diagnosed as "schizophrenia" and one of these showed marked psychopathic features. Another patient was diagnosed as a "hysterical psychopath" with a history of drug addiction, while in one the diagnosis was indefinite and he was considered to suffer from either a post-traumatic organic mental syndrome or schizophrenia. Of the eight female patients, four were involuntional depressions and in two of these there was evidence of "lifelong mental instability". One patient suffered from recurrent depression and two were schizophrenics. There was one case of paraphrenia. The mean age of the male cases was 34 years and of the females 43 years, which is considerably older than the mean ages of "depersonalization syndrome" cases. The development of symptoms was closely related to the onset of depression in the majority of cases and in eight patients followed, within a short period, the death of a parent or close relative. Only two patients had made a suicidal attempt but seven others were considered to be potentially suicidal. Apart from depression, four patients described emotional changes in terms similar to those used by "depersonalized" patients. "Emotion has died in me" was a typical complaint. It must be emphasized that these patients were selected simply as subjects for a perceptual test in the belief that their bodily complaints were perceptual in nature and no attempt can be made in this paper to study the clinical aspects of their complaints in adequate detail. The symptoms stressed are those which suggest a disorientation of the body percept in space and in relation to its own central axis, since the recognition of these complaints, in part, suggested the experimental approach to be described below. It is hoped in a later study to present a more comprehensive and orderly description of psychiatric disturbances in the perception of the body.

The bodily sensations can be divided into several groups. The first are those changes in feelings concerning the *position of the body in space*.

One male patient described this when he said "My shoulders are not square, although I am standing up straight my body does not feel straight. Everything else is in its right place and square. It's me that's not all right." His head also felt as though there was something pushing it forward and to the right. Another male patient complained that his body seemed pulled back but that when he looked at his feet they were going forward. Similar sensations were noted by seven patients and in addition three of them felt a tendency to deviate to the affected side when walking.

Feelings of a changed gravitational pull were also noted. One patient felt that his coat was pulled down and was unable to lift a cup with his right hand because the cup "was too heavy". The same patient felt at times, however, that he was being lifted up off his heels. Another patient complained of his feet being either stuck to the floor or "floating upwards". Such changes were frequently noted when the patient was lying in bed.

Changed sensations of body mass concerned some patients and these were generalized as with a man, who complained that his body and bones were hollow, or, in the case of a woman, had a unilateral distribution affecting the left side of her body, which felt hollow and empty as did the left arm and left leg.

Changes in feelings of the flexibility or rigidity of the body, together with

disturbances of feelings of muscular tension, were quite commonly described. Rigidity is often noted as being in "the spine" which one man said was like a stiff rod while his legs were like rubber. The sensations of muscle tension might be increased in the calf muscles or in the hands and face or they might be lost completely. There might be no difference in the sensation of muscle tension whether the patient was sitting down or standing erect, so that one patient found that "when I make movements I don't know how I'm making them". As a result the body could feel "very still". Feelings commonly expressed of being like a "puppet" or "automaton" seem to be related to these sensations.

The *unilateral distribution* of abnormal sensations to right or left, either in the head or the whole body, is a very common feature in distortions of the perceived body. Thus, the right or left side of the body may feel numb, hollow, cold or dead or there may be pain, pressure or "trickling" sensations located in one side of the face or head. Unilateral "pulling down sensations" are not uncommon and may involve the eye, as in the woman who complained of a pulling down sensation from the left eye to the left buttock. Two other patients complained of exactly similar sensations, while in two cases not included in the experimental study the left eye felt "pushed out".

Loss of awareness of the relative position of body parts has been noted as only occurring in severe disturbances and was generally described as an inability to know where parts of the body were. They seem to go all over the place; "they fly off at different angles and I don't seem to be in one piece" was a typical complaint.

Feelings that *the body, the head or the limbs are swelling or contracting* occur in some patients but were only noted as transient phenomena in the patients under consideration.

The sensation that there were *holes in the body substance* was found in one patient who felt that there was a hole where the left ear should be, and another patient complained of a similar sensation at the bottom of his spine.

Loss of sensation in the whole body or in body parts led one patient to place his hand across two electric terminals to prove, to his surprise, that sensation was still present. Others described a complete absence of feeling; "I can't smell, taste or feel anything".

Changes in the appreciation of space were very common and often of unilateral distribution occurring on the same side as the disturbance of body awareness.

Changes in *co-ordination between visual and other senses* were clearly described by two patients. One said "most people don't realize they've got a body; they're not concerned with where it begins and ends. It's as if they've got eyes all over them." He felt that, although he could see, he was really blind when moving about and had to touch things when walking between two objects. At times he knocked into things, usually on the left side. Another patient, when doing the washing up in the ward with the dirty dishes on his right side, found that if he turned to the right "the rest of my body and my eyes would not co-ordinate to pick the dishes up". Poor co-ordination of the visual and postural sense was often noted when the patient was travelling in a vehicle.

Distortions of visual perspective were noted by one patient in this series who felt himself pulled to the left. When he looked at windows or the television screen the left side of the square or rectangle appeared to be at a lower level than the right side. Two patients tended to bump into objects on the affected side.

Unilateral visual disturbances were described as a dimness of vision on one side; "I cannot take in vision on that side", or objects might be described as

looking wider and not so high on one side while on the other side everything was in correct perspective.

A more generalized *change in the appearance of the world*: "Everything looks different, dark and dull" was found in a few patients. Vague complaints of the need for spectacles or for a change in spectacles were very frequent.

Other characteristics are the persistence of symptoms over long periods or the recurrence of a similar pattern after an interval of many years. Two patients declared that they had had symptoms for more than ten years and there was objective evidence to support this. Another patient had similar symptoms at the age of 13 and again at the age of 32. As previously noted a cyclical appearance of symptoms was also noticed. In all but two cases the duration of the disability was longer than a year and recovery when it occurred was always slow. Variations in the symptoms were also found to occur from time to time. They were frequently worse when the patient was tired and upset and in one patient they were relieved by motion and in others by something which aroused their interest. It is impossible to discuss at any length the relation of these findings to those described by other authors, but a few comparisons are possible.

Only Scott (1951) and Norman (1954) have referred specifically to changes in the uprightness of the perceived body, although one of Angyal's cases (1936) felt "drawn back" and a case of Mayer-Gross (1936) said, "I am only a head—and yet it draws me down to one side." The increase or decrease of a sensation of the gravitational pull or weight of the body has been noted in the interparietal syndrome (Angyal, 1937) and in the lysergic acid and mescaline psychoses (Beringer, 1927; Guttmann, 1936; Anderson and Rawnsley, 1954). Changes in feelings of body flexibility or rigidity are briefly noted by Guttmann (1936), one of whose patients felt "everything was so stiff" while another described the arms as "wooden". There appears to be a complete absence of reference to one-sided distortions of body perception except for the report of a single case by Scott (1951). The loss of awareness of the position of various parts of the body and changes in the appreciation of the size and shape of limbs has been observed by all writers, but whether this is because the symptom is frequent or because it excites the interest of subject and observer alike is uncertain. The perception of "holes" in the body substance is referred to by Schilder (1935) but not by other authors. Alterations in the perception of right and left receive no mention but pulling sensations on the eyes are mentioned by Mayer-Gross (1935).

Turning now to the appreciation of space, difficulties in visuomotor coordination similar to that seen in our cases was stressed by Scott (1951) and by von Angyal (1937) whose patient missed things if he tried to reach for them on the table. Changes in perspective were noted with lysergic acid psychoses by Anderson and Rawnsley (1954) whose subjects saw things "on the slant", by Scott's patient who had, in consequence, difficulties in drawing, and by von Angyal's patient. Brightening or shadowing of the visual world is described by most authors, and micropsia, macropsia and dysmegalopsia, which were not noted in our patients, are often recorded in descriptions of the "Interparietal Syndrome". Unilateral disturbances of space perception are only noted by Scott. The long duration of symptoms has been stressed by Mayer-Gross and Shorvon as have the beneficial effects of movement or emotional stimulation.

It can be seen that the present group of cases thought to show perceptual disturbances of body awareness have features in common with previous descriptions of Body Image disturbance. Several features not previously emphasized, namely the dislocation of the body upright, the unilateral location

of symptoms and the loss of co-ordination between visual and tactile spheres of the Body Percept, are stressed as being particularly relevant to the present experimental study of distorted body awareness.

THE EXPERIMENTAL STUDY OF THE DISTORTIONS OF THE PERCEIVED BODY

The earliest workers on Depersonalization, Taine (1870) and Krishaber (1873), believed that the condition was due to a disturbance of sensory perception. Although no such perceptual disturbances could be shown on tests, Pick (1904) continued to believe that it might be possible to demonstrate such changes. Mayer-Gross (1935), discussing possibilities for the further study of depersonalization, declared that "the most accessible way at present seems to me to make use of the refined methods of modern physiology for studying sensory perception". Discussing the negative experimental results of Shorvon (1946), he felt that they "were disappointing but not conclusive" and urged further experiment.

Angyal and Blackman (1940) reported on vestibular reactivity in schizophrenic patients and found it particularly reduced in patients with the "Interparietal Syndrome". They inferred, without adequate proof, that the symptoms were due to changes in muscle tonus. Angyal (1936) also favoured changes in muscle sense as the cause of symptoms in the "Interparietal Syndrome" and related the disturbances to Ponzo's illusion but did not carry out any experiment. Von Angyal (1937) made a detailed study of postural phenomena in another case of "Interparietal Syndrome" and showed changes which he felt supported the presence of a pathological process in the parieto-occipital region. Scott, R. D. (1954) performed tests of visual perception on his cases and found disturbances in colour constancy and in the appreciation of figures exposed in the tachistoscope.

The experimental method to be described below evolved from a consideration of the symptoms, in patients with body image disturbance, of changed visual and visuo-spatial appreciation. Bertrand Russell (1948), in his book on "Human Knowledge", points out that "when you both see and feel a pin touching your hand it is only experience that enables you to identify the point of contact seen and the point of contact felt by touch. To say that they are the same place is convenient, but in psychology it is not strictly accurate; what is accurate is that they are correlated places in two different spaces, visual and tactual." These spaces are related in our experience of our body; in the framework of our perceived body. It is arguable, therefore, that any weakening in the structure of the perceived body would be accompanied by a weakening of the relationship between perceived visual and tactual space. The disturbing effects of changing the relations of visual and tactual space on our bodily perceptions had been demonstrated by Stratton (1896) in his well known experiments with lenses which turned everything seen upside down and from left to right, and by Klein and Schilder (1929) with the Japanese illusion. They showed how dependent our bodily perception is on the integration of visual sensations with touch and other sensations and how vague and unclear it became when the usual relationship of the visual and tactual spheres was altered. It seemed, therefore, that a study of the differences between our visual perceptions, on the one hand, and our tactile and postural perceptions on the other would yield information concerning the body percept in which they are normally integrated.

The method which was used and will be described below in full was devised by Witkin and Asch (1948) to determine the individual's perception of the

upright when sitting in a completely dark room. The subject can only see a tilted luminous frame surrounding a luminous rod and he is instructed to orientate this rod to the upright. Thus, the subject is deprived of the visual perception of his own body while in the appreciation of the room space his visual cues to the vertical are, when the frame is tilted, in conflict with tactile, kinaesthetic and vestibular cues from his body. In such a situation subjects with a vague or distorted body percept would possibly have difficulty in resolving this conflict between the visual and tactile-postural perceptions; and errors in perception of the vertical would result.

THE EXPERIMENTAL METHOD

The method employed in this investigation has been described by Witkin and Asch (1948) in their studies of perception of the upright and called by them the "Rod and Frame" test. In a completely darkened room the subject, whose eyes have been covered before he is led in, is sitting upright in a chair. He is presented at a distance of about 5 feet with a luminous frame 40 inches square and 1 inch in width pivoted at its centre so that it can be tilted at various angles to the right and the left of the upright. Inside this square frame and pivoted on the same centre, but moving independently, is a luminous rod 39 inches long and 1 inch wide (Figs. 1 and 2). Since the test is conducted in a darkened room,

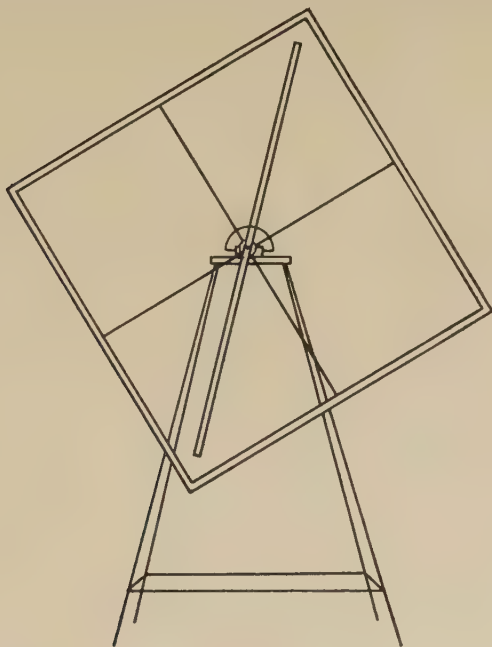


FIG. 1

the subject can only see the frame and the rod which can be moved easily by the examiner who stands behind the apparatus. The amount of the tilt of either rod or frame is registered in degrees on a fixed protractor (Fig. 3). Before the subject was brought into the room the light was left on to "freshen" the luminous paint on the frame and rod. The subject was shown the rod and frame in the following four positions: (a) with the frame tilted 28° to the left and the rod tilted 28°

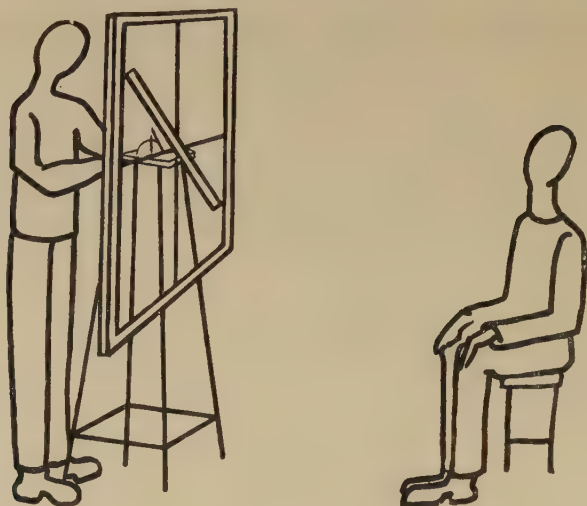


FIG. 2

to the right (position A); (b) with the frame tilted 28° to the left and the rod tilted 28° to the left (position B); (c) with the frame tilted 28° to the right and the rod tilted 28° to the right (position C); (d) with the frame tilted 28° to the

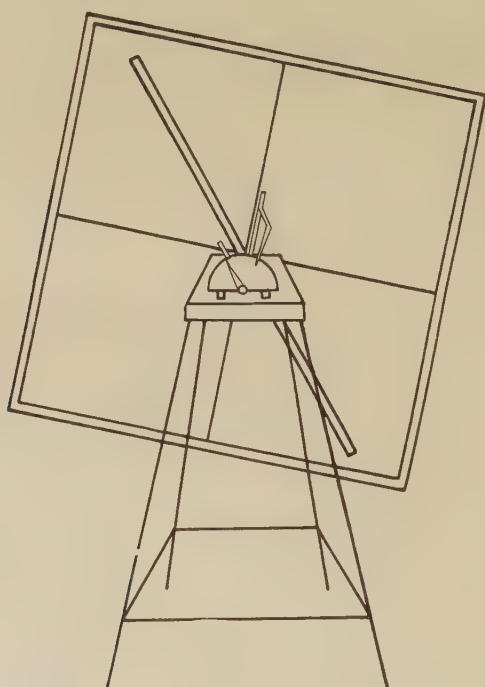


FIG. 3

right and the rod tilted 28° to the left (position D). When the subject's eyes were uncovered he was first asked what he could see to ensure that the rod and frame were completely visible. The subject was then told to say in what direction and

how far the rod should be moved so that it would indicate the upright in relation to the walls and himself, in these words: "I want you to tell me how to move the rod so that it points straight up and down parallel with the walls and in line with you as you are sitting. Tell me to move it to the right or to the left and then say 'more' when you feel it is not yet in the correct position, or 'enough' when you feel that the position of the rod is satisfactory."

These instructions differed from Witkin's only insofar as the subjects were told to bring the rod in line with themselves. Despite criticisms by Mann and Boring (1953), which have been answered by Witkin (1953), it was felt that these instructions were easily understood and that judgments were made quickly and accurately under the influence of a compelling sense of the upright. The subjects included many who were psychiatrically ill, but there was little difficulty in understanding what was required and, rather surprisingly perhaps, there was no objection to being blindfolded and led into a darkened room. The eyes were covered by an assistant while the examiner made readings of the tilt of the rod in degrees on the protractor and while the position of the rod and frame was adjusted. After a "trial run" through the four positions, i.e. A, B, C and D, each of the four positions were presented four times in a previously determined random order. Sixteen observations were made on each subject, although in a few patients tested later in the series, when analysis of variance had shown that there were no practice or fatigue effects in the four readings, only eight or twelve readings were made. The deviations in the subject's placement of the rod to right or left of the upright were measured in degrees to right or left of the gravitational upright.

GROUPS OF SUBJECTS

Five groups of subjects were tested and were grouped as "normals", "schizophrenics", "leucotomized schizophrenics", "organic mental syndromes" and the group showing distortions of bodily perception whose clinical features have been discussed in a previous section. It is necessary now to discuss the composition of the first four groups.

The "Normal" Group. This comprised 25 male and 25 female members of the nursing, medical, secretarial and occupational therapy staff of the hospital. All were from the United Kingdom as were all the subjects of these experiments except one patient with body percept disturbance who came from Austria. Their ages ranged from 19-50 years. All were questioned concerning handedness, but no evidence of any relationship between the results and handedness was found and the matter was not pursued.

The "Schizophrenic" Group. This included 12 male and 12 female schizophrenic patients from this hospital. In all cases there was, as far as could be ascertained, no doubt about the clinical diagnosis and no evidence of changes in body perception, although this may have been overlooked in one female patient. The mean ages were 36 years for males and 33 years for females. The personality was in all cases fairly well preserved but some patients were recent admissions while others had been in hospital many years. The only limiting factor in selection was the capacity of the patient to co-operate in the testing.

The "Leucotomized Schizophrenic" Group. Three male and three female leucotomized schizophrenic patients were tested. Two males and two females were long-stay patients while one male and one female are not at present in hospital. The mean age of the men was 31 years and of the women 56 years. The operation performed was in each case a bilateral prefrontal leucotomy, and

since the operations had not been done recently they were probably quite extensive "cuts".

The "Organic Mental Syndrome" Group. Five male and five female patients were tested. The mean age of the males was 48 years and of the females 43 years. It was a very diverse and rather unsatisfactory collection of organic brain conditions and the value of the results is, therefore, limited, but a control "organic" group was felt to be necessary.

The diagnoses of the male patients are given below: Post-traumatic cortical atrophy with marked dementia; frontal meningioma (post-operative); recent severe head injury; calcification of basal ganglia with early dementia; cerebrovascular accident with aphasia and early organic dementia. A localized lesion could only be recognized in two cases.

The diagnoses in the female patients were general paralysis of the insane; prolonged hypoglycaemic coma with cognitive deterioration in a patient suffering from schizophrenia; organic mental change associated with disseminated lupus erythematosus; unclassified dementia, possibly arteriosclerotic; parietal syndrome following removal of a meningioma and deep X-ray therapy. This last case has been reported elsewhere (Reinhold, 1951). In only one case, the last, could the lesion be localized. The handedness of the patients was considered as it was felt that it might be related to the results.

The "Body Percept" Group consisted, as previously noted, of 8 male and 8 female patients with a mean age for the males of 34 years and for the females 43 years. Their selection, clinical features and diagnoses have been considered.

THE RESULTS

The errors in degrees to right or left of the upright in the placement of the rod were recorded and the mean of sixteen, or in a few cases eight or twelve, readings taken. The smaller number of readings could be taken when it had been shown that the number of readings did not affect the results; there were no significant practice or fatigue effects.

These mean errors, in degrees, of rod placement for the four presentations of rod and frame, A, B, C and D, are arranged for the five groups of subjects, divided according to sex, in Table I.

TABLE I
Mean Errors, in Degrees, of Rod Placement

Position	Class	Frame Left		Frame Right	
		Rod Right	Rod Left	Rod Right	Rod Left
		A	B	C	D
<i>Males:</i>					
Normal		3.75 L	4.71 L	2.79 R	1.77 R
Schizophrenic		3.00 L	5.01 L	2.76 R	0.51 R
Leucotomized schizophrenic		3.00 L	6.00 L	2.01 R	0.00
Organic		0.60 L	0.00	6.60 R	5.40 R
Body percept		0.00	5.64 L	6.75 R	2.25 R
<i>Females:</i>					
Normal		2.79 L	4.32 L	1.34 R	0.69 L
Schizophrenic		0.00	2.49 L	2.01 R	0.69 L
Leucotomized schizophrenic		3.00 L	2.01 L	2.01 L	0.99 L
Organic		2.40 L	7.20 L	9.00 R	6.00 R
Body percept		1.86 R	7.50 L	11.25 R	1.86 L

L=Left. R=Right.

It can be seen that with certain exceptions the errors in rod placement follow the tilt of the frame. The initial position of the rod is also of importance but less than the position of the frame. The errors in positions B and C are greater than in A and D for all groups save the organic.

In the normal group there is a significant sex difference in positions C and D ($t=2.500$ and 4.316 respectively) but there was no significant sex difference in the other groups.

The normal, schizophrenic and leucotomized schizophrenic groups show no statistically significant differences from each other in the amount and direction of their mean errors. The organic and body percept groups differ, however, from the other groups and the statistically significant differences in the mean errors, using Student's t ratio, are shown in Table II.

TABLE II
Significant Differences in Mean Errors of Rod Placement

Comparison		Position	t	d.f.	Level Per cent.
<i>Males:</i>					
Normal	v. Organic	C	2.097	28	5
Normal	v. Body percept	A	2.600	31	5
Normal	v. Body percept	C	2.131	31	5
Schizophrenic	v. Body percept	A	2.326	18	5
<i>Females:</i>					
Normal	v. Organic	C	2.376	28	5
Normal	v. Body percept	C	4.507	31	1
Schizophrenic	v. Body percept	C	2.897	18	1
Leucotomized Schizophrenic	v. Body percept	C	2.663	9	5

In all groups except the organic the mean errors differ significantly under the varying positions A, B, C and D. In testing this statistically, the leucotomized schizophrenics were pooled with the schizophrenics and the results obtained by analysis of variance are given in Table III.

TABLE III
Difference of Mean Errors for Positions A, B, C and D of Experiment

Class	F-ratio for Conditions	Error d.f.	Level Per cent.
Normals	11.42	147	1
Schizophrenic plus leucotomized schizophrenic	9.68	87	1
Organic	2.34	27	non-sign
Body percept	3.91	45	5

One of the obvious differences between the normal subjects and the organic or body percept groups was the marked leftward tendency of the errors made by normals in the placement of the rod. This tendency, was therefore, analysed in all subjects, and the positions B and C, since they showed the greatest mean errors to left and to right respectively, were selected for comparison. Subjects were classified as showing "left excess" if their error to the left in position B exceeded their error to the right in position C by more than 3 degrees, and "right excess" if their error in C exceeded the error in B by the same amount and the "same" if the errors in positions B and C were within 3 degrees. The numbers of subjects showing a leftward or rightward tendency in the groups

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(the leucotomized schizophrenic patients were included in the schizophrenic group) are presented in Table IV.

TABLE IV

	Class				Left Excess	Same	Right Excess
Normal	Males	..	..	..	13	7	5
	Females	..	..	..	16	2	7
Schizophrenic	Males	..	..	..	7	5	3
	Females	..	..	..	7	5	3
Organic	Males	..	..	..	1	0	4
	Females	..	..	..	1	2	2
Body percept	Males	..	..	..	3	0	5
	Females	..	..	..	2	0	6

It can be seen that the leftward tendency is indeed most marked in the normal group, that the schizophrenic group do not differ notably and that the body percept and organic groups showed a marked tendency to make their placement errors to the right. This would be more apparent from the figures if the groups were of equal size. If the above numbers are tested statistically in fourfold tables by chi-squared (or, where appropriate, Fisher's exact method), there are significantly fewer organics than normals showing left excess and significantly more organics than pooled schizophrenics showing right excess. There are significantly more body percept patients than normals or pooled schizophrenics showing right excess.

Another difference between the normals and the organic and body percept groups seemed to be in the response to the visual cues. This showed in greater errors in placement of the rod under the influence of the tilted frame and these were analysed as in Table IV by comparing the deviations in position B and C, but only errors in excess of 6 degrees were counted. If the error in placement to left (position B) and to right (position C) both exceeded 6 degrees, the subject was classified as showing "marked deviation both ways". If the error to right or to left exceeded 6 degrees and the corresponding deviation to left and right was less than 6 degrees the patient was considered to show "marked deviation to the right" or "marked deviation to the left". The subject was considered to show "no deviation" if the errors to left or right were less than 6 degrees. Two subjects showed "reversed deviation" with the error to the right in position B and to the left in position C. Both these subjects had decided that the tilted frame was a "diamond" and adjusted the rod to upper angle of the frame. Table V shows the numbers of subjects in the various groups (schizophrenic and leucotomized schizophrenic patients are again considered together).

If fourfold tables are constructed from the above numbers comparing the various groups in regard to

- those showing marked deviation both ways or reversed deviation versus those showing marked deviation one way only or not at all,
- those showing any marked deviation versus those showing no marked deviation at all,

the following significant differences emerge when the figures are tested by chi-squared or Fisher's exact method. Under (a) significantly more organic and body percept patients than normals showed a marked deviation both ways. Under (b) significantly more organic and body percept patients than normals

TABLE V

Effect of Visual Cues

Class		Marked Deviation Both Ways	Marked Deviation Left Only	Marked Deviation Right Only	No Deviation	Reversed Deviation
Normal	Males ..		3	2	20	
	Females ..		4	2	19	
Schizophrenic	Males ..	1	3	1	10	
	Females ..		1	1	12	1
Organic	Males ..		1	2	2	
	Females ..	3			1	1
Body percept	Males ..	1	1	2	4	
	Females ..	1	2	4	1	

or pooled schizophrenics showed any sort of marked deviation (both ways or left or right).

The results show that under the experimental conditions, as other workers have found, there are errors in the placement of the rod to the upright and that in normal subjects these are comparable to those found by Witkin and Asch (1948). In normal subjects, too, there is a significant sex difference as reported by Witkin (1949b).

Schizophrenic patients and leucotomized schizophrenic subjects do not differ significantly from normal subjects in their mean errors of placement, their tendency to right or left deviation or their dependency on visual cues. The organic and body percept group show marked and significant differences from the other groups in their particular tendency to right deviation and their dependence on visual cues. There were no significant differences in this study between the organic and body percept groups. This remarkable finding will require further investigation with larger and better classified groups.

No study of the relationship between the direction of the errors of placement and the symptoms of individual patients in the body percept group or between the direction of errors and location of the brain damage in individual members of the organic group was made, but these relationships are of great importance and will be further investigated.

The results show that there are good reasons for believing that in patients showing a distortion of their bodily perception there is a breakdown in the relationship of the tactile, postural and kinaesthetic cues to the visual cues in the perception of the upright. This disturbance in the perception of the upright does not significantly differ from the disturbance found in patients with undoubted brain disease.

DISCUSSION

Many writers have indicated the connection between man's perception of his body and his perception of space. Schilder (1935) said that "right, left, below, above in space are extensions of the postural model of the body", while Head and Holmes (1911) stressed that it was to the Body Schema that "we owe the power of projecting our recognition of posture, movement and locality beyond the limits of our own bodies". Witkin (1949a, 1953) believes that experimental observations on the perception of the upright "do evaluate the manner

of the individual's perception of his own body", and Sandström's (1951) study of the "luminous point phenomenon" has persuaded him that the errors occurring in the attempted localization of a luminous point in the dark "are due to an unconscious exaggeration of the possibilities of the body image". Goody and Reinhold (1952, 1953) stress the importance of the longitudinal axis of the body for human orientation. They believe that vertebrate animals orientate themselves in relation to this structure and that space and the body are perceived as two fields extending on either side of the midline.

The association of symptoms of disordered bodily perception with disturbances of the orientation of the body percept in space was noted in the cases described. The changes in the position of the longitudinal axis in particular supported the possibility of a relationship between disturbed bodily perception and errors in the perception of the upright; a relationship confirmed by the experimental results. Although, as Fellenius (1944) remarked, the conception of our own body may enter in one way or another into all our perceptions, previous experiment into perceptual changes accompanying alterations in the body image when restricted to the visual sphere, as in the Rorschach studies of Shorvon (1946), Guttman (1936) and Anderson and Rawnsley (1954) has yielded negative results.

Considering now the results obtained from measuring the errors in perception of the upright it is necessary to examine in more detail some of the significant findings.

The Sex Difference. The sex difference in errors of vertical perception found in our normal subjects has been noted by other observers; notably Witkin (1949b) who found that in the rod and frame experiment women tended to align the rod and frame to a greater extent than did men, and felt that women were "less able to involve the body in making their adjustments". He also noted (1953) that women give a more variable performance and accept the visual framework more passively than men. His assessment of personality by Rorschach, Thematic Apperception Test and Figure Drawing Test on the same subjects revealed no significant differences in mean personality scores between the normal male and female subjects which would parallel the differences in perceptual performance. From a consideration of the Figure Drawing Test results, using the method of Machover (1949), Witkin concludes that there is a greater identity between body and "self" in women and suggests that women have a greater difficulty in developing "a clearly differentiated body image". Sandström (1951), too, noted greater deviations for women than for men in his "luminous point" experiments and the deviations were greater for the left hand than the right. He found similar sex differences in a later study (1954). In a not altogether comparable situation, Szymanski (1913) observed a sex difference when blindfold boys and girls had to walk across a room. The deviations were to the right and the boys deviated more than girls.

Rightward and Leftward Tendencies. The presence of rightward and leftward tendencies in perception of the upright is difficult to explain. In the rod and frame test normal and schizophrenic subjects showed a marked leftward tendency while "body percept" and organic patients showed a rightward tendency (Table IV). Among normal subjects men showed a significant rightward tendency compared to women. Individual differences are, however, marked; some normal women or schizophrenic subjects showing a rightward tendency and some organics, body percept cases and normal men a leftward tendency. Such deviations are not referred to by Witkin (1948, 1953) but other writers have commented on the tendency of human beings deprived of vision,

either by darkness, fog or a blindfold, to deviate to one or other side. Guldberg (1897), experimenting with blind persons, concluded that each individual has a definite side to which he proceeds. "One has right or left turning individuals who are, as experiment shows, bound to these certain directions." Lund (1930), examining blindfold students, found right and left deviations with a preference for the right. Schaeffer (1928) conducted experiments in which his subjects not only walked but rowed, swam and drove cars. He found a tendency to spiral movements and that left-handed subjects took the same course as right-handed subjects. Lenkner (1934) found that more subjects veered to the left than to the right, as did Rohrer (1946). Sandström (1951) found that in his rod grasping experiments the hand deviated predominantly to the left. In a more recent study Sandström (1954) has found that when subjects with the head laterally tilted had to adjust a pivoting rod by means of tactual and kinaesthetic media to the apparent upright in an absolutely dark room, "the deviations from the true upright fall within the same quadrant, especially the left one". Neal (1926), investigating the adjustment of a line of light to the vertical in a dark room, found that all errors took place in a counter-clockwise direction (left side) and was at a loss to explain this. Werner and Wapner (1949), on the other hand, found that for their subjects in a dark room a luminous rod, which had to be adjusted to the vertical, was always displaced to the right.

There is some confirmation, therefore, of individual differences in rightward and leftward tendency which are constant for the individual and not influenced by handedness. This is in agreement with our findings. There is, however, considerable disagreement about the preponderance of rightward and leftward tendencies, which may depend on the sex of the subjects investigated. Sandström's and Neal's results, however, seem to confirm the experimental findings for the normal subjects reported here. The relation between right and left deviation in vertical perception and right and left sided symptoms has not yet been fully investigated.

Perception of the vertical in organic brain disease. It has been shown (Table IV) that the greatest errors in perception of the upright occur in the body percept and organic groups. Several investigators have studied the perception of the vertical and horizontal co-ordinates of the visual system in organic brain disease and Bender and Jung (1948) found that the changes vary with the hemisphere involved. They found that in right-sided brain lesions the deviations were in an anti-clockwise direction from the patient's point of view (to the left in our terminology) and that with left-sided brain lesions the deviations were in the opposite direction (to the right). They also believe that right-sided cerebral lesions give rise to more marked deviations than comparable lesions of the left hemisphere. In the three cases in our series where the brain lesion could be localized, a rightward deviation of the upright was found in the case of a right frontal and of a left parieto-occipital lesion, while slight left deviation was found with a right parieto-occipital lesion. There was, therefore, no unequivocal confirmation of Bender's and Jung's views. McFie, Piercy and Zangwill (1950) conclude that the minor hemisphere is "of some special significance in regard to visual space".

The correspondence between the changes in leucotomized schizophrenic patients and normals suggests that the frontal lobe lesion does not cause any lasting disturbance in vertical perception and this confirms the earlier findings of Teuber (1951, 1952). In a later report Teuber and Miskin (1954) found that in the Aubert situation, where the subject has to adjust a rod to the vertical with the body tilted, patients with frontal lobe lesions did less well than either

normals or patients with a lesion in another part of the brain. None of our subjects were, however, tilted.

It seems that cerebral dominance may in a manner not clearly understood play a part in determining the rightward and leftward errors in the perception of the upright; not only in organic brain disturbances but in normal individuals and patients with body percept disturbance. The relationship is not a simple one; there is no clear connection with handedness and it is idle to speculate on the mechanism without further evidence. The striking similarity between errors in perception of the upright in patients with body percept disturbance and those with organic brain disease, both in the degree and direction of the errors, calls for comment and further investigation. At present it does not seem that there is any causal relationship in terms of brain pathology. There was no detectable neurological lesion or organic mental change in the body percept cases included in this study, although two cases not included showing similar disorder of bodily perceptions have been shown to have an organic mental change. The similarity in the degree and pattern of the errors is surprising but, in any case, the possible ways in which error could show itself are very limited. The possibility that there is an organic brain disturbance as postulated by Angyal, Gurewitsch and Mayer-Gross must certainly be further considered.

Other causes of errors in the perception of the upright have been considered. It seems that schizophrenia can be excluded as a causal factor since schizophrenic patients did not, unless there was an associated disturbance of bodily perception, differ significantly from normals. The possibility that depression was a factor is suggested by the frequency of depression among the patients with distorted body perception, but it has not yet been systematically investigated. Witkin *et al.* (1954) considered this possibility because some of their findings pointed to such a relationship but they were not able to substantiate it. No study was made of the personality factors, which Witkin *et al.* (1954) in their recent book *Personality Through Perception*, believe can be related to varied performance in perception of the vertical.

In considering other explanations of the causes of errors in the perception of the upright, mention should be made of the work of Werner and Wapner (1949) who found that when patients were stimulated on one or other side of the neck by a faradic current, the perceived vertical was displaced to the side of the increased tonus. They also found that the "true vertical is seen by most people as tilted to the right" and infer that there is "a natural asymmetrical tonus distribution which is to the right for the majority of subjects and which produces a tilt of objects in the visual field". Although the effect of changes in body tonus (Kleint, 1937) or light acting as a tonus inducing factor (Roelofs, 1936) or labyrinthine stimulation (Nagel, 1898 and Urbantschitch, 1903) on the perception of the vertical is well established, it seems doubtful whether perception of the upright is normally dependent on a tonus asymmetry. Morphological asymmetry, stressed by Guldberg (1897) and Lund (1930) and denied by Schaeffer (1928) as a cause of deviations of movement to right or left, has not so far been invoked to explain errors in vertical perception. It would seem that cases of hemiplegia should, if Werner's and Wapner's views are correct, show marked changes in vertical perception. I have made no systematic observations but one case of hemiplegia, tested and not included in the series above, showed no significant errors in perception of the upright.

In some tests of visual perception it has been shown that artistic training can significantly influence the results (Thouless, 1932). It does not seem that in vertical perception special training is of importance. Gruen (1951) who investi-

gated a group of dancers found their performance in tests of vertical perception was only moderately influenced by a training which clearly requires careful attention to bodily sensation. Perception of the vertical is certainly related to organic brain disease. Witkin's results purport to show a correlation with personality variables, while this investigation points to a relationship between bodily perception and the perception of the upright. This is a complex field for further research. Perhaps the most important conclusion to be drawn from these experiments is that a study of the errors in correspondence of two independent but related spheres of perception is a useful method for investigating disturbances in the Body Percept. Witkin's orientation experiments examine errors in correspondence between the visual sphere and postural sphere (tactile, kinaesthetic and vestibular) in the attempt to establish the perceptual upright.

Other experimental methods, such as M. B. Bender's (1952) method of simultaneous bilateral cutaneous stimulation, for investigating the perception of the body are adding to our still limited knowledge. Clinical studies have up to the present centred around the "phantom limb" phenomenon. A broadening of this field of clinical investigation, coupled with experimental observations, may throw light not only on the structure and pathology of the body percept—itsself a matter of great interest—but also yield information of greater importance for psychiatry as a whole.

SUMMARY

(1) The nature of bodily perception and its relationship to the more familiar "body image" concept is discussed.

(2) Disturbances of the body percept with disorientation in space, displacement of the central bodily axis from the vertical or division in the sagittal plane of the perceived body into halves are described.

(3) An experimental method using the measurement of errors in perception of the vertical is described and related to the disturbances in perception of the body.

(4) Groups of normal subjects, schizophrenic, organic and body percept cases have been tested by this method and the results found in the different groups are compared and contrasted.

(5) The errors in perception of the vertical of schizophrenic and normal subjects were found to differ significantly from the errors of organic and body percept cases. There was no significant difference between the results of organic and body percept cases.

(6) A significant leftward tendency in perception of the vertical was found in normal females and in schizophrenic subjects of both sexes. A rightward tendency was found in normal men and organic and body percept cases.

(7) The significance of this sex difference and of the rightward and leftward tendency, together with other proven and suggested causes of errors in perception of the vertical, are discussed.

(8) The value of a study of errors in perceptual tests where two spheres of bodily perception are involved for the investigation of disturbances of body perception is emphasized.

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THE EFFECTS OF PREFRONTAL LEUCOTOMY UPON
VISUAL IMAGERY AND THE ABILITY TO PERFORM
COMPLEX OPERATIONS

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INTRODUCTION

Two observations made on the post-leucotomy patient inspired the investigation to be reported in this paper. They are, first, that the post-leucotomy patient seems unable to deal with two things at once. Both Ackerly (1935) and Brickner (1939) have referred to this deficit. The second observation was that there was apparently lesser vitality of imagery after operation. A photographer in Pippard's study (1955) who had had, as he said, a "photographic memory", could no longer connect people's faces with photographs of them he had taken in the past. A 35 year old schoolteacher in the same study completely lost her visual imagery after operation, and Brain (1954) has reported a similar deficit in two cases. Zangwill and Humphrey's report (1951) of cessation of dreaming in some patients after brain injury is possibly related to this deficit. Petrie (1952) found an increase in reversals, especially willed reversals on the Necker Cube after operation, and Gordon (1950) has presented findings showing that the control of fluctuation was significantly related to less vivid and controlled imagery.

The investigation reported here was designed to examine further these two post-leucotomy deficits, and to see if they were related in any way.

SUBJECTS

Patients

Results on all or some of the tests were obtained from twelve patients. There were seven male and five female patients, and the age range was from 20 years to 61 years. They fall into the following diagnostic groupings:

Schizophrenia	..	..	..	..	..	4
Paranoid Schizophrenia	..	..	..	..	..	4
Manic Depressive	..	..	..	..	..	1
Hysterical Psychopath	..	..	..	..	..	1
Depression (Obsessive-Ruminative State)	..	..	..	..	..	1
Obsessional Neurosis	..	..	..	..	..	1

All the patients were given a Standard Bilateral Prefrontal Leucotomy.

All twelve patients studied were co-operative and did not seem to have any difficulty in orientating themselves to the test situation. Two other patients proved unco-operative before leucotomy and were not included in the group.

Normal Group

Fifteen subjects were tested. There were nine male and six female subjects, and the age range was from 20 years to 31 years. The group was made up of nurses at the Crichton Royal and psychology students.

METHOD

The main test of the battery used is based on Von Kuenburg's Figure-Matching Test used by Rylander (1939) in his study of patients with frontal lobectomies. The test was given to examine the post-leucotomy patient's ability to deal with two things at once. In this test the subject is given a data card (for five seconds) bearing a number of meaningless figures (see Fig. 1). Although the figures are similar, one occurs twice, i.e. it appears in identical form in two different positions on the data card. The subject is then asked to find this identical figure on a multiple choice card (identification) (see Fig. 1), and to indicate on another location card (see Fig. 1), the positions which the identical

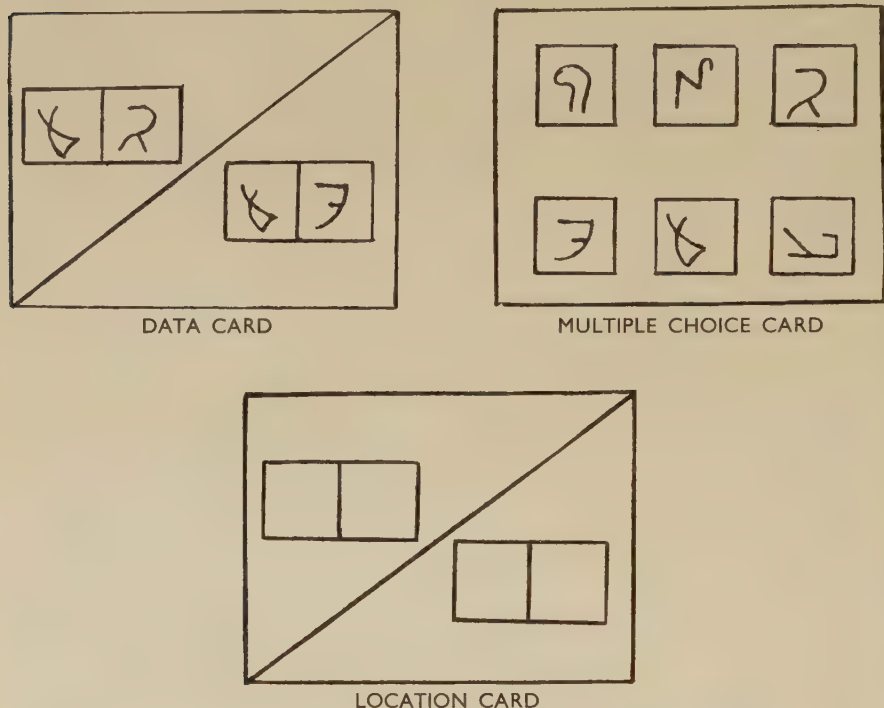


FIG. 1.—An example of the 2×2 type of problem in the Figure-Matching Test.

figures had occupied on the original card (localization). There are thirteen cards of the two by two type. The first card is a trial card and the performance on this is not scored; in the first three cards of the test proper the subject has to identify the figure first and localize it second; for the second set of three cards the localization comes first and then the identification; for the third set of three cards the subject has only to identify the figure; for the fourth set of three cards the subject has only to localize the figure.

There are thirteen cards of the three by three type (see Fig. 2), and they are arranged as the two by two type.

A Letter-Matching Test was designed. This test is exactly the same as the Figure-Matching Test apart from the fact that instead of figures there are letters (see Fig. 3), and one arrangement of letters occurs twice.

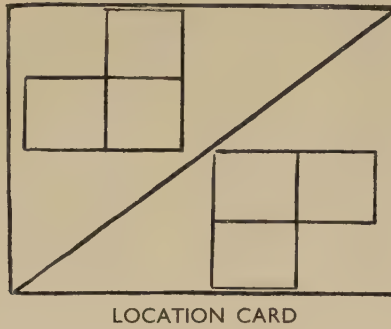
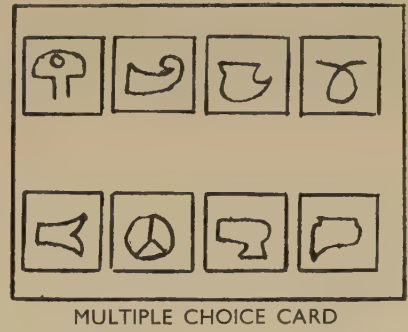
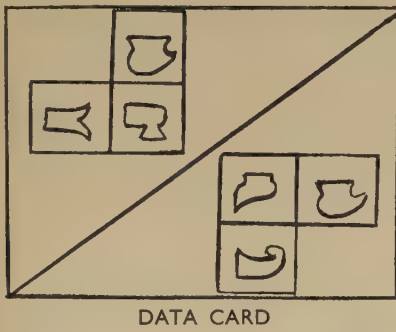


FIG. 2.—An example of the 3×3 type of problem in the Figure-Matching Test.

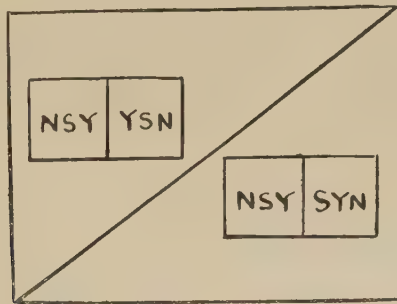


FIG. 3.—An example of the data card of the 2×2 type of problem in the Letter-Matching Test.

The following tests were also given to the patients:

Raven's Progressive Matrices (1938)—to assess changes in intellectual capacity.

The Mill Hill Vocabulary Scale—to assess changes in verbal ability.

The Moray House Space Test Adv. 1.

Group Test 80A of the National Institute of Industrial Psychology, which is also a Space Test.

Both of these tests were given to assess changes in the ability to manipulate visual images.

The patients were tested one week before (Session I) the operation, and at intervals of two weeks (Session II), and ten weeks (Session III) after the operation.

The normal subjects were given, in addition to the tests described above,

the following tests in order to examine further the relationships between performance on the Space Tests and the nature of the subjects' visual images:

The Necker Cube.

The Rosemary Gordon Test of Visual Imagery in which the subject has to visualize eleven scenes involving a car, e.g.:

1. A car standing in front of a garden gate.
2. The same car, but in a different colour than that seen at first.
3. The same car lying upside down.

The subjects were also asked a number of questions about their visual imagery and dreams.

HYPOTHESES AND RESULTS

PATIENT GROUP

Figure-Matching Test

If the post-leucotomy patient is unable to hold in mind and deal with two things at once, we would not expect him to perform so well after the operation on the Figure-Matching Test where he has to remember the figure in order to identify it, and also the positions of the identical figure. The patient's performance on the first three cards of the two by two and three by three problems we will refer to as his FP score (FP indicates that the subject has to identify the figure on the multiple choice card first, and then pick the positions on the location card). To obtain a score of 1 on each item the patient has to both identify the correct figure and pick the positions correctly. Failure on either one or both of these aspects is given a zero score. The patient's performance on the second set of three cards of the two by two and three by three problems we will refer to as his PF score.

The first hypothesis can be stated thus:

Hypothesis I. There will be a drop after leucotomy in the patient's FP and PF score.

Adding together the FP scores and PF scores for the two by two and three by three problems (maximum score=12) the means for the group of nine patients at each Session is as follows:

<i>Session I</i>	<i>Session II</i>	<i>Session III</i>
M=9.66	M=5.55	M=7.66

The difference between the means of the scores at Session I and II is significant at the .01 level ($t=3.18$; d.f.=16). The difference between the means of the scores at Session I and III is not statistically significant ($t=1.57$; d.f.=16).

The results provide evidence for a temporary drop in FP and PF scores after leucotomy on the Figure-Matching Test. The slight rise again from Session II to Session III may be due to practice effects and familiarity with the material. It is not in itself evidence against an hypothesis of the deficiency being a permanent one.

The results for the FP and PF scores can also be presented in the following form:

Session I-Session II (9 patients).

			No. of patients whose scores at Session II are:		
			<i>Lower</i>	<i>Unchanged</i>	<i>Higher</i>
FP score: 2×2 problem	..	..	4	5	0
3×3 problem	..	..	5	4	0
PF score: 2×2 problem	..	..	7	2	0
3×3 problem	..	..	8	1	0

Session I-Session III (9 patients).

				No. of patients whose scores at Session III are:		
				<i>Lower</i>	<i>Unchanged</i>	<i>Higher</i>
FP score: 2×2 problem	..	..	3	6	0	
3×3 problem	..	..	6	3	0	
PF score: 2×2 problem	..	..	3	6	0	
3×3 problem	..	..	6	3	0	

The number of patients whose scores are lower, unchanged, and higher is given rather than the actual difference in scores, because the maximum score for each set of problems (e.g. FP score 2×2 problem) is only 3. It should be pointed out that the column headed "Higher" has been included for completeness. Actually a number of the patients obtained a full score of 3 at both sessions, and there was no room for a rise in score.

It will be seen on examining the above tables that at Session II the tendency for the scores to be lower is more marked in the PF scores than in the FP scores. No explanation can be given for this, but it may be worth further investigation. The above table also suggests that though the drop in score at Session III is not statistically significant, there is a marked tendency for the scores to drop on the three by three problems.

If the difficulty encountered by the post-leucotomy patient is that of holding two things in mind at the same time, we would not expect his scores to drop when he has only to identify the figure or pick the positions of the identical figure. F scores refer to the third set of three cards (2×2 and 3×3 problems). P scores refer to the fourth set of three cards (2×2 and 3×3 problems). The next hypothesis can be stated thus:

Hypothesis II. There will be no drop in the F and P scores.

Adding together the F and P scores for the two by two and three by three problems (maximum score=12) the means for the group of nine patients at each Session is as follows:

<i>Session I</i>	<i>Session II</i>	<i>Session III</i>
M=11.77	M=11.22	M=11.77

The difference in scores is not significant and the results support Hypothesis II. The results for the F and P scores can also be presented in the following form:

Session I-Session II (9 patients).

				No. of patients whose scores at Session II are:		
				<i>Lower</i>	<i>Unchanged</i>	<i>Higher</i>
F scores: 2×2 problems	..	..	0	9	0	
3×3 problems	..	..	1	8	0	
P scores: 2×2 problems	..	..	2	7	0	
3×3 problems	..	..	2	7	0	

Session I-Session III (9 patients).

				No. of patients whose scores at Session III are:		
				<i>Lower</i>	<i>Unchanged</i>	<i>Higher</i>
F scores: 2×2 problems	..	..	0	9	0	
3×3 problems	..	..	0	9	0	
P scores: 2×2 problems	..	..	0	9	0	
3×3 problems	..	..	1	8	0	

Letter-Matching Test

In view of the observation made by Petrie and others as to the lesser vitality of visual images after operation, the question that presented itself was: Could it be that in the Figure-Matching Test two visual images of shape and localization are involved, and that one must be lost if the other is to survive? If this is taken as our hypothesis then the following deduction can be made: Due to the lesser vitality of imagery in post-operative patients, there will be a bigger drop in score when only one form of imagery is used (visual) compared with his score when two forms of imagery (visual and visuo-verbal) are employed. The Letter-Matching Test was designed to test this deduction.

LP scores refer to the first set of three cards (2×2 and 3×3 problems), PL scores to the second set of three cards (2×2 and 3×3 problems). The deduction from Hypothesis III can be stated thus:

Deduction from Hypothesis III. The drop in LP and PL scores will be less than in the FP and PF scores.

The mean difference in the FP and PF scores for Session I and Session II is 4.11. The mean difference in the LP and PL scores for Session I and Session II is 2.44. The difference in mean differences is not statistically significant ($t=1.01$; d.f.=16). The mean difference in the FP and PF scores for Session I and Session III is 2 and the mean difference in the LP and PL scores for Session I and Session III is 2.22. The difference in mean differences is not significant.

The results do not provide evidence in support of the deduction from Hypothesis III.

Space Tests

If there is lesser vitality of visual imagery after leucotomy, we would expect some change on the space tests. El Koussy (1950) has shown that the more the tests are saturated with the K factor, the more they depend on the process of visualization and manipulation in the mind.

Moray House Space Test, Adv. 1 and N.I.I.P. Space Test (7 patients).

An examination of Figures 4 and 5 suggests a centralizing tendency, i.e. those whose score is high before leucotomy obtain lower scores after the operation, and those whose score is low before the operation obtain higher scores afterwards. This centralizing tendency, evident at Session II, is more marked at Session III. Though this change is not statistically significant, in the few cases available it seems sufficiently marked to justify some speculation.

Evidence will be provided later, when the results of the normal group are presented, showing that subjects with vivid autonomous imagery tend to score low on the space tests and subjects with weak controlled imagery tend to score high. This suggests that the patients who before leucotomy, scored low on the space tests had vivid autonomous imagery, which was made weaker and more controlled by the operation, thus resulting in a higher post-operative score. Secondly, patients who had high scores before leucotomy had weak controlled imagery which was made weaker by the operation. The drop in score for these patients is apparently due to the fact that, though their imagery is controllable, it is now too weak for the images to be formed easily.

Miscellaneous Tests

Raven's Progressive Matrices (1938) (11 subjects).

	<i>Session I</i>	<i>Session II</i>	<i>Session III</i>
Mean scores:	34.90	30.45	33.36

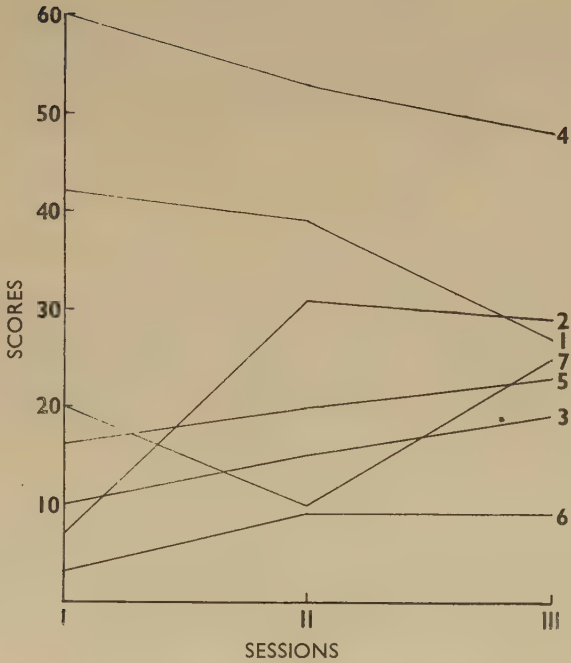


FIG. 4.—The Scores of seven patients on the Moray House Space Test Adv. 1, at Sessions I (before leucotomy), II and III (after leucotomy).

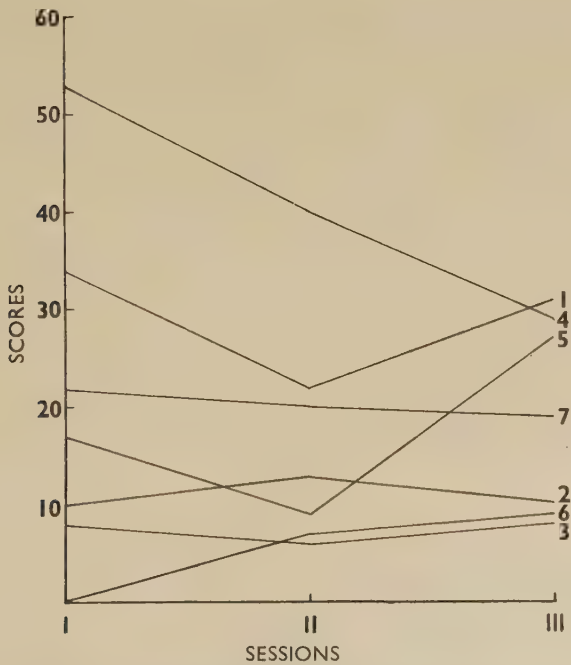


FIG. 5.—The Scores of seven patients on the N.I.I.P. Space Test at Sessions I (before leucotomy), II and III (after leucotomy).

The tendency is for the scores to drop at Session II and to rise again at Session III. The difference in score is not statistically significant.

Mill Hill Vocabulary Scale (11 subjects).

	<i>Session I</i>	<i>Session II</i>	<i>Session III</i>
Mean scores:	50·90	49·45	50·54

There is little or no drop on the Vocabulary Scale after leucotomy.

NORMAL GROUP

Rosemary Gordon Test of Visual Imagery

The fifteen subjects were given this test and then split into two groups. Group 1 consisted of those subjects who were able to visualize all the eleven scenes in the test. Group 2 consisted of those subjects who were unable to visualize one or more of the eleven scenes. It is noteworthy that even where subjects in both groups were able to visualize a scene, the subjects of Group 2 had more difficulty in doing so than those in Group 1.

All the subjects of Group 1 said that they rarely had dreams, or that they were vague and not remembered. None of them reported what is known as a "photographic memory", and were not conscious of visual images playing any part in their thought processes.

All the subjects in Group 2 reported frequent vivid dreams; two of the subjects reported experiences of autonomous vivid images, and one claimed a photographic memory.

There were nine subjects in Group 1, and six subjects in Group 2, and all the subjects were given the following tests:

Necker Cube

The subject was first of all asked to look at the cube for one minute, and to tap with a pencil each time the cube reversed its perspective. He was then asked to look at it for a minute and try to increase the number of reversals per minute as much as he could tapping each time it reversed. Lastly, the subject was asked to reduce the number of reversals per minute as much as he could.

The mean difference in number of reversals for normal and fast speeds for Group 1 is 24·78, and for Group 2 it is 8. Groups 1 and 2 differ significantly in their ability to vary the rate of reversal. Comparing their ability to change from a normal to a fast rate of reversal, *t*—calculated on the basis of the difference in number of reversals for normal and fast speeds—was found to be 3·6, *P* being, therefore, less than 0·01.

The mean difference in number of reversals for fast and slow speeds for Group 1 is 34·67, and for Group 2 is 14·5. In the case of a change from fast to slow speeds *t* was found to be 3·89, *P* being, therefore, less than 0·01. The autonomous group in each case was significantly less capable of adjusting the rate of reversals to the new instructions.

Space Tests

		<i>Group 1</i>	<i>Group 2</i>
N.I.I.P. mean score		52·89	29·83
Moray House mean score		69·17	50·66

The subjects of Group 1 obtained higher scores on the space tests than the subjects of Group 2. The difference is not significant statistically on the Moray House Space Test Adv. I, but is statistically significant at the ·001 level on the N.I.I.P. Test (*t*=4·36).

Raven's Progressive Matrices (1938)

	<i>Group 1</i>	<i>Group 2</i>
Mean scores	55.44	54.5

The difference in score between the two groups on this test is not significant.

Mill Hill Vocabulary Scale

	<i>Group 1</i>	<i>Group 2</i>
Mean scores	67.67	65.5

The difference between the two groups is not significant.

Figure and Letter Matching Tests

All but three subjects gave a completely correct performance on both these tests. The three subjects (two from Group 1, and one from Group 2) failed on one or two items in the Letter-Matching Test.

DISCUSSION AND CONCLUSIONS

One explanation proposed for the difficulty patients have with the Figure-Matching Test is that it requires the patient to attend simultaneously to two different aspects of one task. This means that the difficulty of the post-leucotomy patient is encountered on the data card where he has to find the identical figure and note the positions. The present investigation has shown that the necessity not only to attend simultaneously to different aspects of a task, but even more to maintain two simultaneous modes of response, appears to be an important feature of the test, and that it is on this part of the test that the post-leucotomy patient has difficulty. If the first explanation were the correct one, then we would expect a drop in score after leucotomy on those items of the test where the patient has only to remember one thing, remember the figure or remember the positions, because the problem on the data card is the same as on the data card of the other items, particularly where he has to search for the identical figure and then note the positions to be remembered.

The study of the normal group has shown that people with weak controlled visual images do better on space tests than those with vivid autonomous visual images. The difference in performance of the patients on the space tests before and after leucotomy suggests that the operation lessens the vitality of their images and makes them easier to control. Although a comparison of performances on the Figure-Matching and Letter-Matching Test does not indicate that the finding of a change in visual imagery has anything to do with the drop in performance on the Figure-Matching Test, the finding is itself interesting.

The lesser vitality of visual images may partly explain what Freeman and Watts (1942), have described as the deficit in foresight and planning after leucotomy. Brain (1951), has pointed out that emotion provides the motive power which sustains our course of action, and if the action is to take time, the object to which it is directed must be constantly represented to us by means of mental imagery. Without images the person lives in a perpetual present unable to adapt future behaviour to his past.

The role played by vivid images in the illness of a patient is not clear. That mental illness is not a necessary concomitant of vivid and even autonomous imagery is fairly certain. Two intelligent normal subjects in the present group reported experiences of autonomous images. One, a female subject, described an experience in which she saw herself throwing a kitten into a fire. "I tried to change the picture," she said, "so that I would be stroking the kitten. I was not

able to do so and I felt a tenseness in my body." A male subject said he often saw a ball of wool before him which he would unwind continuously without ever coming to the end. The role played by vivid images in the pre-occupations of obsessionals, the memories of the depressed, and the painful anticipation of the anxiety states and their relation to hallucinations, needs to be investigated further.

SUMMARY

(1) A battery of tests was given to a group of twelve patients one week before, and two weeks and ten weeks after a standard bilateral prefrontal leucotomy.

(a) Performances on a Figure-Matching Test suggest that the post-leucotomy patient is less able to maintain two simultaneous modes of responses after the operation.

(b) Performances on a Letter-Matching Test suggest that the task is not made any easier for the post-leucotomy patient when he can employ two forms of imagery (visual and visuo-verbal).

(c) Data from the Moray House Space Test Adv. 1 and the N.I.I.P. Space Test suggest that leucotomy produces a centralizing tendency in performance on these tests, i.e. those whose score is high before leucotomy obtain lower scores after the operation, and those whose score is low before the operation obtain higher scores afterwards.

(d) There are no significant changes on Raven's Progressive Matrices (1938), and the Mill Hill Vocabulary Scale.

(2) A group of normal subjects was given the Gordon Test of Visual Imagery, and a dichotomy was obtained between those with weak, controlled, visual images (Group 1), and those with vivid, autonomous, visual images (Group 2).

The difference in scores for these two groups was statistically significant on the Necker Cube and the N.I.I.P. Space Test, and was not significant on the Progressive Matrices (1938), the Mill Hill Vocabulary Scale, and the Moray House Space Test Adv. 1.

(3) The general significance of the results is discussed.

ACKNOWLEDGMENTS

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NEUROSIS AND PSYCHOSIS: AN EXPERIMENTAL ANALYSIS*

By

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THE problem we are concerned with is the relationship between neurosis and psychosis. It is well known psychiatrically that many patients tend to be what are called "mixed" states, meaning that the diagnostic classification is doubtful. Patients complaining of physical symptoms, such as sleeplessness, heart palpitations, and other signs of autonomic imbalance, accompanied by anxiety or phobias, and who seem well reality-oriented, are not hallucinated or deluded and do not show any cognitive deterioration, are classed as neurotics. Psychotics, on the other hand, are generally deluded and hallucinated, are poorly reality-oriented, tend to show signs of cognitive deterioration, but have an absence of the physical symptoms so characteristic of neurotic disorders.

Unfortunately, these sorts of syndromes are "classical" or "textbook" cases only rarely encountered clinically. They are very much the "pure" type of neurotic and psychotic, and shown these, practically no psychiatrist would hesitate in his diagnosis. The confusion arises when, as is so often the case, patients present a "mixed" picture, complaining of symptoms from each category. This is especially the case with "early" neurotics or psychotics, because as time goes on, one or other of the disorders often appears to become dominant and one apparently displaces the other or is superimposed upon it.

Now in observing these "mixed" cases as they appear clinically, two equally feasible interpretations can be posited, each compatible with psychiatric experience. Either neuroses and psychoses differ in degree of severity of illness only, or both disorders are present simultaneously. On examining the first possibility, the explanation of the phenomenon of the "mixed" case is that neurotics, as they get more neurotic, in other words, as their illness progresses and becomes more severe, develop more and more psychotic symptoms, which finally displace the original ones. If a psychotic should improve he goes through the neurotic stage back to normality. This interpretation suggests that the two main mental disorders are measurable along one continuum, with normals, neurotics and psychotics separated from each other only in degree of severity of their symptoms. It is a continuum believed by psychoanalysts to be one of "psychosexual regression", in which psychotics are most regressed, neurotics less so, and normals not at all. A "mixed" case is, therefore, one in which the patient finds himself in "transit", as it were, from one category to another; if he is becoming more severely ill he may already be showing psychotic symptoms, while still retaining some neurotic ones, and conversely if he should be recovering from a psychosis, he might have to show some neurotic symptoms en route to normality.

The other possible explanation for the undoubted presence of symptoms from both disorders in the same patient is that both disorders may in fact be present. If a patient is suffering from cancer and deafness he will show both

* This article is based upon a dissertation submitted in partial fulfilment of the requirements for the Ph.D. degree at the University of London.

syndromes simultaneously but there is no reason to suppose that therefore poor hearing develops into cancer. Similarly, it may be that neurotics are also psychotic sometimes, or vice versa, without there being any need for one disorder to develop into the other. This hypothesis, then, would suggest that the problem is a two dimensional one, in which neuroticism and psychoticism are separate axes and independent of each other. Both possibilities are reasonable, logical, and consistent, but both cannot be simultaneously true.

The older school of psychiatry believed that neurosis and psychosis were separate disorders that could be present in one and the same individual simultaneously. More modern opinion, in particular the analytical school, holds that the only difference between the two major mental states is in degree of severity. Equally eminent authorities in the mental health field can be found to support either of the hypotheses. Myerson (15), though not in agreement with the concept of regression, expressed the view that: "Neuroses span the bridge between . . . normal mental states and certain psychotic states." He expressed the standpoint of this side very succinctly in the following paragraph: "I formally introduce the concept of the neuropsychoses. The neuropsychosis comes into being by an intensification of the symptomatology of the neuroses. Unreality becomes that falsification of reality called delusion. The sense of being deficient becomes unworthiness, sin, and punishment. The change in bodily sensation passes from the stage of severe hypochondriasis to the somatic delusion. This development can be traced in many cases. It can be noted as a variable and reversible process, appearing or receding, as the patient gets worse or as he gets better." Finally, he believes that: "the anxiety neurosis may and does become an anxiety psychosis, which, I believe, is the proper definition of involuntional melancholia." Rather than neuroses giving place to psychoses, however, one might argue that one diagnosis is replaced by another as the more dominant disorder manifests itself. Lewis (11) put forward the view that "Neurotic persons suffering from depression or excessive fatigue suddenly commit suicide. Such are undoubtedly psychoses from the beginning or at least it is not possible that one type of psychiatric disorder changes into another. To assume that such a change occurs or is possible we must have much more supporting evidence, as such a concept does violence to established biological laws."

Two facts have been established for us. The first is that neuroticism is not a state which is distinct from the normal, but that all stages of it are represented along a continuum (2, 3). There is only an arbitrary line of demarcation to one side of which people are called "normal" and to the other side of which they are considered neurotic enough to be sent to hospital. The second is that the same arguments hold for psychoticism (3, 4). We know, then, that neuroticism denotes a continuum from the normal to the extreme neurotic, and similarly that psychoticism denotes a continuum from the normal to the extreme psychotic. Our problem is to conduct an experimental study to decide between two equally feasible hypotheses regarding the relationship between these two continua. It would seem an important theoretical matter, quite apart from the practical importance of improving the psychiatric classificatory system with a view to applying the appropriate treatment to each case.

Eysenck (3) has discussed the question of the relation between normal, neurotic, and psychotic groups, and has compiled a series of diagrams in which mean scores for the three groups, normal, psychotic, and neurotic, were plotted, one test on each axis. They all gave a "triangular" pattern rather than a linear one, thus confirming the opinion of the Kraepelinian school, who considered the

major psychiatric groups to differ by more than just degree of severity. De (1) in a factorial study of the Word Association test found similar results. Freeman (9) using the Character Interpretation test obtained results also favouring the "two dimensional" approach. Lubin (13) used normal, neurotic and psychotic groups and gave them four sub-tests of the U.S.E.S. Manual Dexterity test. He analysed the data using canonical variate analysis and concluded that two dimensions were required to account for the distributions of scores made by the subjects in the three groups. Eysenck (6), in a similar study using more diversified tests, came to the same conclusion. Finally, Trouton and Maxwell (18), in a factorial study of symptom ratings on almost a thousand male patients, obtained two clear orthogonal factors which they identified as neuroticism and psychoticism respectively.

Evidence from different sources, using different types of tests and different methods of analysis, therefore, tends to support the two-dimensional rather than the one-dimensional point of view. However, the results cannot be regarded as definitive in view of the small numbers employed in some of the researches listed, and doubts as to the adequacy of the statistical methods in others. In particular, general factorial methods lack the final stage required for the solution of this problem, which is an estimate of the significance of the factors obtained. It seemed worth while, therefore, to carry out a large scale study using a type of statistical analysis which permitted of an exact assessment of significance.

POPULATION

In order to get our results as clearly defined as possible it was not only necessary to get well diagnosed patient groups, but also to be somewhat careful in our choice of the normal control group. Ideally one would like a control group composed of individuals not suffering from mental disorders of any kind. But since neuroticism and psychoticism are each present to some extent in everybody, we were obliged to content ourselves with the criterion that none of the subjects should ever have been interviewed by a psychiatrist, except when army selection procedures of some kind necessitated it: none of the individuals were to have sought psychiatric help. Our control group was composed of four sub-groups, two male and two female. The male groups were both from the army. One came from the Royal Army Educational Corps, whose 30 members were all intelligent and stable individuals; most of them had received extensive educational training which enabled them to try for a commission in the army. Their ages ranged from 18 to 39 years. The other group of 29 subjects from the Royal Artillery re-allocation depot, was composed mostly of volunteers rather than National Service men, and turned out to be of low intelligence and poor stability. Their ages ranged from 18 to 45 years. The female groups were 29 student nurses from King's College Hospital and 35 student Occupational Therapists from the Maudsley Hospital, both of whom were of average intelligence (or above) and made stable and co-operative impressions. Their ages ranged from 19 to 33 years.

The patient groups consisted of in-patients of the Maudsley and Bethlem Royal Hospitals. Their ages ranged from 16 to 49 years for the 24 male neurotics, of whom 8 were hysterics and 16 Anxiety States; from 19 to 50 years for the 31 female neurotics, of whom 7 were hysterics and 24 Anxiety States; from 15 to 48 years for the 13 male schizophrenics; from 17 to 49 years for the 15 female schizophrenics; from 33 to 57 years for the 12 male psychotic depressives, and from 24 to 64 years for the 15 female psychotic depressives.

There were, altogether, 55 psychotics and 55 neurotics, but as in isolated cases not all the tests were completed by each subject the numbers varied a little from group to group as indicated in the tables, 53 and 51 subjects respectively having scores for all the tests.

We tried to test only patients whose diagnoses were predominantly neurotic or psychotic so that as few "mixed" cases were seen as possible. Also, patients with certain physical disabilities were excluded because loss of a hand, for example, would have made tests such as manual dexterity impossible. Finally, we had to insist on subjects being British, or at least having a very good command of the English language so that they would not be at an unfair disadvantage on the Word Association test.

A rough matching for sex was achieved between the groups, but age and intelligence provided significant differences between the groups (Tables I and II).

TABLE I
t and F Ratio Results for the Age Variable

	n	m	v	F	Per cent. Level
Controls	123	22.244	20.727	82.588	0.1
Neurotics	53	30.019	61.557		
Psychotics	51	38.804	162.961		

Controls and psychotics $t=12.632$ (significant at the 0.1 per cent. level)

Controls and neurotics $t=6.012$ (significant at the 0.1 per cent. level)

Neurotics and psychotics $t=5.690$ (significant at the 0.1 per cent. level)

TABLE II
F Ratio Results for the Intelligence Variable

	n	m	v	F	Per cent. Level
Controls	123	14.886	21.626	34.578	0.1
Neurotics	55	11.927	29.180		
Psychotics	55	8.255	27.045		

Fortunately correlations between the tests used and the two variables are very low throughout (Tables III and IV), only 8 out of 36 being significant, and then

TABLE III
Correlations with Age

	Controls	Neurotics	Psychotics
Expressive movements	0.121	0.326*	0.211
Manual dexterity	-0.275*	-0.099	-0.111
P.G.R.	-0.099	-0.086	-0.451**
Static ataxia	-0.068	-0.051	0.145
Maudsley Medical Questionnaire ..	0.113	0.238	0.105
Word association	0.022	0.071	0.037

$n=123$

$n=53$

$n=51$

Significance Levels

($n-2$)

	d.f.	5%	1%
Controls	121	0.177	0.232
Neurotics	51	0.271	0.351
Psychotics	49	0.276	0.358

TABLE IV

Correlations with Intelligence

			Controls	Neurotics	Psychotics
Expressive movements	..	..	-0.044	-0.153	-0.159
Manual dexterity	..	..	0.150	0.321*	0.383**
P.G.R.	..	..	0.184*	0.120	0.226
Static ataxia	..	..	0.110	-0.022	0.102
Maudsley Medical Questionnaire	..	..	-0.282**	-0.339*	-0.270
Word association	..	..	0.134	-0.144	-0.072
			n=123	n=53	n=51

(Significance levels as in Table III)

usually for one of the groups only. For no test are correlations significant for all three groups. It is unlikely, therefore, that age and intelligence could have accounted for the major results reported below.

Even if it were possible to regard intelligence as a unitary trait it would be very difficult to choose groups equated for intelligence or to partial out its effects from the data, because there would still be great practical difficulties to overcome. Furneaux (10) has reported on the series of Nufferno tests that have been developed which gave a hint of the complexity of the concept of intelligence. He has shown that there are at least three main independent determinants of success in conventional intelligence tests: speed (the time taken to complete the items successfully solved), continuance (the persistence or length of time an individual will keep on trying for a solution), and error (the error checking mechanism or the ability to realize that an error has been made at all). These very interesting findings suggest that the intelligence "level" is a composite score of three independent components which must be measured separately to get a true estimate of the weak and strong aspects of an individual's score. Clearly, two of the three components of intelligence are not themselves cognitive faculties, and orectic influences may be of considerable importance. This is an especially serious point when dealing with abnormal groups because the relation among these variables may be different within the groups. Therefore it would be quite impossible to partial out the effect of "intelligence", because intelligence, as measured by any of our more usual tests, is not in fact a unitary variable at all. In other words, if we partialled out the effect of these three variables in some arbitrary combination we might remove an orectic pattern vital to the disorder under investigation (5).

Having decided, then, not to partial out intelligence, the alternative procedure was adopted of only using tests showing relatively low correlations with intelligence, as conventionally measured. This does by no means solve this very difficult problem, but ensures that even on conventional grounds our results are acceptable. We used a short test of intelligence and correlated the results with individual tests for each group. We used part of the Shipley-Hartford test of deterioration for our test of intelligence because it was short, timed, and gave us the intelligence level of each individual at the time of testing rather than that before his breakdown. (The abstractive ability part of the test was used, this being the part which is supposed to measure the deterioration as distinct from the vocabulary part which is learned before the illness and is presumed to be retained.)

DESCRIPTION OF TESTS

Sixteen tests were administered to each subject, these being given in two sessions of approximately an hour and a half each. On analysing the data, six tests were chosen on which to perform a Discriminant Function analysis. The rationale for selecting these particular tests was based on a number of considerations. Primarily they were required to have an F ratio which was significant at a very high level, so that the differentiation between the groups could not have been due to chance errors. Since a large number of scores were in this category other considerations now entered into our choice. The tests seem to fall into several groupings with respect to mental functions, and we used those that differed most from each other, i.e. tests of autonomic imbalance, motor control, a questionnaire, etc. Furthermore, we chose only one score from each test, so that there was complete experimental independence between the scores. The distributions were required to be normal, and finally, only those scores were used which had very low correlations with age and intelligence (Tables III and IV).

The six scores concerned were:

The Amplitude Score on the Waves Test (4)

In this test subjects are presented with a sheet of paper with a V marked in each corner; two of these are vertical and the other two horizontal. The instructions are for the subject to trace over the first V shape, then close his eyes and continue to draw a series of six similar V shapes along the page. Each set of waves is covered by the experimenter before the subject opens his eyes to draw the next set, so that size exaggerations are not seen until the test is at an end. The score we chose was the average amplitude over all four sets of waves.

The Total Score on the U.S.E.S. Manual Dexterity Test (3)

This total score was the sum of four sub-tests which the subject performed. The first involved placing pegs from the top half of a board to the lower half with both hands, the second required that each peg be turned over, with one hand only, and replaced in the same hole. The third and fourth parts involved finger rather than manual dexterity, and required the subject to assemble, and in the second case dis-assemble, washers and pegs on a small board.

Percentage Change Score on the Psychogalvanic Reflex Test

The subjects were asked to lie on a couch for a "test of relaxation", and had dry electrodes strapped to their palms. They were left to relax for the first fifteen minutes, and a series of stimuli were then applied. They were asked to hold their breath and were then requested to answer more questions from the Maudsley Medical Questionnaire, which they had previously encountered while doing another test. The "threat" effect of this request provided us with a change score from which a high F ratio was obtained between the groups. Since the scores were not normally distributed, a square root transformation was used to stabilize the variance. Details regarding this test and conditions of testing are given elsewhere (7).

Maximum Backward Sway Score (in Square Root Units) on the Static Ataxia Test

Both Body Sway and Static Ataxia (2) gave surprisingly good differentiations between the groups on backward sway. The score chosen is a measure of the maximum distance a subject swayed backwards during the 30 seconds duration of the Static Ataxia test. In this test a string is attached to the subject's

clothing and runs back to a marker on a kymograph, thus enabling us to obtain a continuous record of the path the subject traversed during the thirty seconds of the test. The units in which our results are given are not in actual distances swayed, but in the corresponding distances covered in the records of the kymograph, and furthermore, these were also transformed into square roots (as were the PGR scores) in order to normalize variances. (In this test subjects are told to stand as still as they can and to keep their eyes shut.) For details see Eysenck (2).

The Total "Abnormal" Responses Score on the Maudsley Medical Questionnaire

This questionnaire (3) comprises a series of items listing symptoms such as "Do you suffer from sleeplessness?" The score was simply the number of items a subject endorsed. The questionnaire was given in two parts, one during the Luria test and the other during the PGR test.

Synonyms Score on the Word Association Test

A list of thirty words was shown to the subject, one at a time, and he was required to "give the first word that comes into your mind". The subject simultaneously manipulated the hand plates of the Luria test, but the score we used here was concerned only with his actual responses to the stimulus words. We took a series of scores, but selected the "number of synonyms given" score for our final analysis.

RESULTS

Waves. Table V*

We have included with our own results some which were obtained by Eysenck (3, 4) using a neurotic population in one case and a psychotic one in

TABLE V

		Waves						
Average amplitude:		Controls		Neurotics		Psychotics		Per cent. Level of F
		m	v	m	v	m	v	
This study	..	21.825	12.574	23.711	20.188	26.647	35.213	0.1
Eysenck 1952	..	22.38	14.58	—	—	26.70	30.78	0.1
Eysenck 1952a	..	25.08	25.96	25.15	32.15	—	—	N.S.
Average wavelength:		Controls		Neurotics		Psychotics		Per cent. Level of F
		m	v	m	v	m	v	
This study	..	88.664	465.543	100.480	570.456	110.178	823.664	0.1
Eysenck 1952	..	89.29	440.90	—	—	108.92	963.17	0.1
Eysenck 1952a	..	100.17	509.30	95.87	640.80	—	—	N.S.
		C		N		P		
This study	..	n=123		n=55		n=55		
Eysenck 1952	..	n=100		n=—		n=100		
Eysenck 1952a	..	n=172		n=76		n=—		

the other. These results seem remarkably similar and bear out our finding that this is a very good test of psychoticism. Psychotics, it seems, exaggerate the amplitude (as well as the wavelength) of the waves they draw blindfolded, to a much greater extent than do the other groups.

Total Score (Manual Dexterity). Table VI

This is another test in which control groups are best, psychotics worst, and neurotics in between. However, it may be possible here that the manual

* Means, variances, and F ratios are given throughout, as well as comparative data from previous studies where available.

TABLE VI
U.S.E.S. Test of Manual Dexterity

	Control		Neurotic		Psychotic		F	Per cent. Level
	m	v	m	v	m	v		
M ..	75.447	44.216	72.618	67.537	66.545	128.215	21.695	0.1
N ..	88.593	104.637	86.745	73.823	77.982	160.166	19.765	0.1
O ..	27.756	24.153	25.291	19.803	21.055	28.978	35.306	0.1
P ..	25.650	10.393	23.945	10.015	21.800	15.793	24.828	0.1
T ..	217.390	395.256	208.600	333.689	186.727	799.795	37.573	0.1
	n=123		n=55		n=55			

dexterity of these groups is slowed down for different reasons. Psychotics may be slow because of their mental retardation, while neurotics are more likely to be negatively affected through their anxiety which causes hand tremors, etc. Scores are given for subtests M, N, O, P as well as for Total Performance.

"Threat" Score (Psychogalvanic Reflex). Table VII

This score shows psychotics to have a markedly lower reactivity to the "threat" stimulus than either of the other groups. They were found to have a

TABLE VII

Psychogalvanic Reflex: "Threat" Score before the Maudsley Medical Questionnaire Stimulus. (Percentage Change in Resistance Units.) (Square Root Transformation.)

	n	m	v	F	Per cent. Level
Controls ..	123	0.184	0.022	7.381	0.1
Neurotics ..	54	0.160	0.024		
Psychotics ..	51	0.095	0.017		

substantially lower resistance than the other groups on all scores of the PGR whether during the rest period or under the influence of stimuli (7).

Backward Sway Score (Static Ataxia). Table VIII

It will be seen that on this test psychotics have a tendency to sway backwards far more than do the other groups. A similar finding was reported by

TABLE VIII

*Static Ataxia: Maximum Backward Sway
(Square Root Transformation and Kymographic Conversion.)*

	n	m	v	F	Per cent. Level
Controls ..	123	0.288	0.143	9.920	0.1
Neurotics ..	55	0.339	0.139		
Psychotics ..	55	0.598	0.342		

Williams (19) for the body-sway suggestibility test; it is interesting to note that the obvious explanation of Williams's finding in terms of the alleged "negativism" of schizophrenics can hardly be held to apply here since no suggestion is, of course, made during the static ataxia part of the test.

Abnormal Responses (Maudsley Medical Questionnaire). Table IX

These results, which agree well with other studies (2, 3) for neurotic groups, show psychotics to have a slightly lower score than neurotics.

TABLE IX

Maudsley Medical Questionnaire: Number of "Abnormal" Responses

		n	m	v	F	Per cent. Level
Controls	..	123	10.114	32.167	65.583	0.1
Neurotics	..	55	20.527	39.921		
Psychotics	..	52	18.192	52.903		

Synonyms Score (Word Association Test). Table X

These figures suggest that normals are less likely to respond with synonyms than are the abnormal groups. Unfortunately, it was not possible to compare

TABLE X

Word Association: Synonyms

		n	m	v	F	Per cent. Level
Controls	...	123	4.480	5.989	7.810	0.1
Neurotics	..	55	6.618	22.426		
Psychotics	..	55	6.164	23.436		

our results (including all the other scores we took on the word association test) with those of De (1), because his interest lay primarily in the comparison of the responses to emotional as compared with responses to neutral words.

STATISTICAL TREATMENT

By using the statistical method known as Discriminant Function analysis it was hoped to throw some light on the problem of dimensionality in the mental health field.

An analysis of variance was performed to find the six most suitable scores for the Discriminant Function analysis. This latter method of analysis for more than two groups has been developed (largely) by Rao (17) and was studied carefully by Lubin (12, 13). Lubin used psychiatric groups similar to our own to demonstrate the statistical method involved, but his main interest lay in the technique rather than in the psychological results obtained.

Discriminant Function analysis involved the calculation of several matrices. First the total product-sum matrix (G) was computed for the six variables, and then the between groups product-sum matrix (B), the difference between these giving us the within groups product-sum matrix (W). We then followed Lubin's (12) method of maximizing the square of the correlation ratio given by

$$R^2 = \left(\frac{\text{deviance between groups}}{\text{total deviance}} \right).$$

In essence, the problem is this: it is required to find the set of weights to use to derive a composite score from the six tests for each subject which will maximize the square of the correlation ratio (R^2) between that composite variate and the groups. Hence, if we take $R^2 = u'Bu/u'Gu$, we arrive at the equation $(G^{-1}B - R^2I)u = O$. (Where G = total product-sum matrix, B = between groups product-sum matrix, u is the column vector of weights, and u' is its transpose, I = unit diagonal matrix.) The values of R^2 which satisfy this equation are the latent roots of the non-symmetric matrix $G^{-1}B$, each root having a corresponding latent vector u.

To obtain $G^{-1}B$ involves calculating the inverse of the matrix G and post-multiplying it by B . This results in a non-symmetric matrix from which the latent roots and vectors are extracted using an iterative method for non-symmetric matrices described by Maxwell (14). As expected, only two latent roots were found as the rank of $G^{-1}B$ is always one less than the number of tests or the number of groups, whichever is the smaller.

Having obtained the two latent roots these were tested for significance using Bartlett's chi-squared test for the significance of the canonical roots:

$$X^2 = -\left(N-1-\frac{q+c}{2}\right) \log_e (1-\lambda), \text{ where } \lambda \text{ is the root whose significance is}$$

being tested, q =number of tests, c =the number of groups and N =number of people. Since the sum of the diagonal entries of the matrix $G^{-1}B$ is equal to the sum of the latent roots, the percentage of the total variance accounted for by each of the roots can be calculated (Table XI). It will be seen that both roots are significant at the 0.1 per cent. level. Thus the results of this research strongly support the hypothesis that neuroticism and psychoticism are two independent dimensions. It is impossible to account for the test responses of our three groups in terms of one dimension only. This does not imply, of course, that additional dimensions might not be required for a more adequate description of mental abnormality. If the neurotic and psychotic groups were to be broken down into sub-groups (i.e. hysterics, psychopaths, anxiety states, reactive depressions, obsessionals, manic depressives, and schizophrenics, etc.), and larger numbers of appropriate tests were employed, it is very likely that further dimensions, such as extraversion-introversion, would emerge. The number of dimensions found in an analysis of this type is limited but not determined by the number of groups and tests used.

TABLE XI
Latent Vectors

			X_1	X_2
1. Expressive movements	..	..	-0.450,045	-0.116,244
2. Manual dexterity	..	..	1.000,000	1.000,000
3. P.G.R.	..	..	0.015,541	0.072,806
4. Static ataxia	..	..	-0.272,682	-0.316,893
5. Maudsley Medical Questionnaire	..	..	-0.774,271	0.394,398
6. Word association	..	..	-0.217,552	0.125,206

Latent Roots

$$\lambda_1 = 0.437,605; \quad \lambda_2 = 0.172,877; \quad \lambda_1 + \lambda_2 = 0.610,482$$

Diagonal entries of matrix $G^{-1}B = 0.610,484$

Hence λ_1 is 71.7 per cent. of the variance and λ_2 is 28.3 per cent.

Significance of the Roots

$$X^2 = -\left(N-1-\frac{q+c}{2}\right) \log_e (1-\lambda)$$

$R_1^2 = \lambda_1$; $X^2 = 127.507$ which is significant at the 0.1 per cent. level.

$R_2^2 = \lambda_2$; $X^2 = 42.026$ which is significant at the 0.1 per cent. level.

Total λ_1 and λ_2 ; $X^2 = 169.533$ which is significant at the 0.1 per cent. level.

As a final step, scores were computed for each subject on both canonical variates, and the percentage misclassification in each group calculated using a Rao quadratic discriminant function. The method is lengthy but the principle is quite straightforward. The latent vectors gave two sets of weights to apply to the scores, so that two measures could be calculated for each subject, one for each canonical variate. These scores Y_1 and Y_2 were found by multiplying the

score of a subject on the tests by the appropriate weights, and summing them over the six tests. Having thus found a composite score for each person on both canonical variates, his position with respect to each axis was plotted, and these co-ordinates were then used in Rao quadratic discriminant function analysis.

TABLE XII
Test Score Diagnosis

		Psychiatric Diagnosis			
		Controls	Neurotics	Psychotics	Totals
Psychotics		2	5	23	30
Neurotics		12	29	11	52
Controls		109	19	17	145
Totals		123	53	51	227

This implies the use of a formula to ascertain the likelihood of a subject belonging to each group. In Figure 1 each subject was given a position (Y_1 and

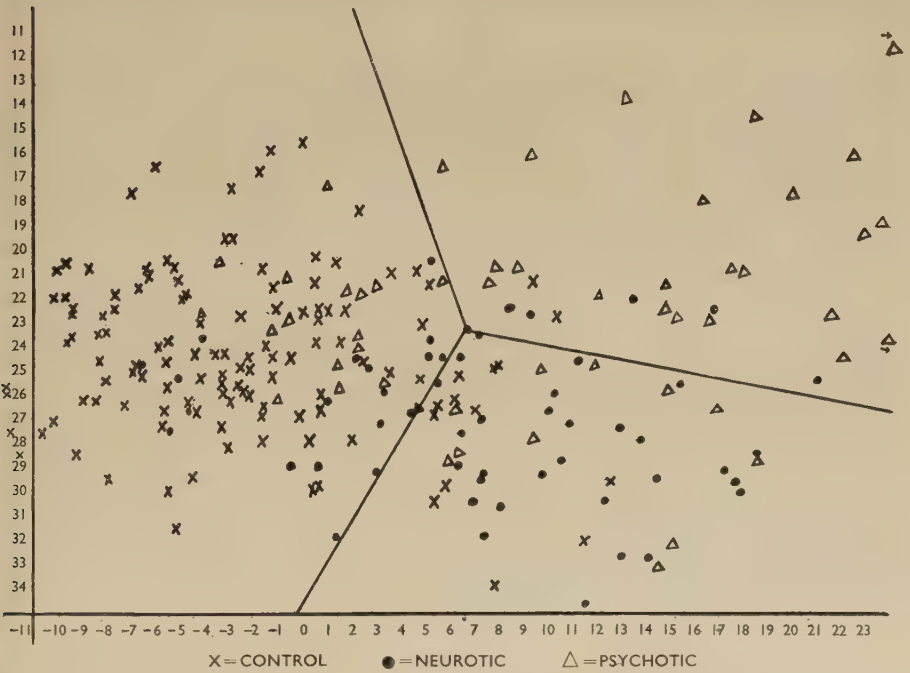


FIG. 1

Y_2 co-ordinates), using crosses to denote controls, dots to denote neurotics, and triangles to denote psychotics. To find the best line of demarcation between the groups, the likelihood scores for borderline cases of the three groups were found, the first lines of demarcation being judged by eye. The likelihood (L_{ij}) of the i^{th} person belonging to the j^{th} group is given by the equation (12):

$$L_{ij} = 2 \log_e (n_j) - \log_e |c_j| - d_{ij} c_j^{-1} d_{ij}$$

where n_j = number of people in the j^{th} group,

c_j = covariance matrix for that group,

d_{ij} = $a(1 \times 2)$ vector giving the deviations of the i^{th} subjects' scores from the mean scores for the group concerned.

The borderline cases, of whom there were some thirty, each had their likelihood scores calculated from the formula above, one for each of the groups irrespective of that to which he was allocated by diagnosis. The best lines of demarcation were thus found.

In this way it was possible to re-classify the subjects according to their calculated likelihood scores, and the results of this appear in Table XII. From these figures it will be seen that 29 per cent. of the subjects were misclassified. Furthermore, if another line is drawn (by eye), in order to find the amount of misclassification between neurotics and psychotics (i.e. leaving out the rather large control group), the misclassification between them is only 21 per cent.

These misclassifications however, may well be due largely to errors in the criterion, that is to say, psychiatric diagnosis, rather than to the test allocation. Evidence regarding the unreliability of psychiatric diagnosis has been reviewed by Eysenck (3), who later (personal communication) found, when following up psychiatric diagnoses on certain subjects whose test results indicated a different diagnosis, that these had been changed in many cases, independently, to agree with the test results.

Apart from misdiagnoses between the two mentally disturbed groups, the composition of all "normal" groups is of course somewhat suspect. Fraser (8) has shown that in an unselected normal group some 10 per cent. showed signs of severe psychiatric disabilities but had not yet resorted to psychiatric help, with a further 20 per cent. showing mild psychiatric disabilities. Consequently, a fixed proportion of control group subjects would be expected to be "misclassified"; they might be "normal" in that they had not been seen by a psychiatrist, yet their test results correctly place them into the neurotic or psychotic categories.

With this argument in mind, separate plots were made for each of the four groups constituting our complete control group. It seemed likely from previous work (3), from common knowledge and observation, that the R.A. Army group, which came from re-allocation units, would contain a larger proportion of psychiatrically abnormal members than would the other groups. The separate plots show that the R.A. Army had 7 out of 29 (or 24 per cent.) misclassified; the King's College Nurses group had 3 out of 29 (or 10 per cent.) misclassified; the R.A.E.C. group had 3 out of 30 (or 10 per cent.) misclassified; and the Occupational Therapists had only 1 out of 35 (or 3 per cent.) misclassified. Clearly, then, if the criteria of diagnoses were improved the percentage of misclassifications might be considerably lower.

SUMMARY

Our problem was to determine whether neuroticism was differentiated from psychoticism qualitatively or quantitatively. The first step was to choose a battery of tests that appeared suitable from the literature; that is to say, tests which were previously found to be good differentiators of neurotic from normal groups, and psychotic from normal groups respectively.

Having chosen sixteen such tests, these were administered to three main groups of subjects; 123 normal controls, 55 neurotics, and 55 psychotics. An analysis of variance was performed on the data to ascertain which of the test scores were the best differentiators. Six scores were chosen for the Discriminant Function analysis, largely on the basis of their high F ratios and their low correlations with age and intelligence. This Discriminant Function analysis was undertaken to ascertain whether the three groups, normal, psychotic, neurotic, could be described in terms of one dimension (one significant latent root only), or whether two dimensions would be required (two significant roots). Since we obtained *two* highly significant latent roots from our data, we conclude that two dimensions are needed to describe the differences of neurotics and psychotics from normal people.

A composite likelihood score was calculated from the set of weights (latent vectors) obtained from the canonical variate analysis, and these were plotted in the two-dimensional space with the variates Y_1 and Y_2 as the co-ordinates. The misclassification rate obtained on

the basis of a redistribution of diagnoses according to test results was 29 per cent., a figure which fell to 21 per cent. when the abnormal groups alone were considered.

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THE USE OF RESERPINE IN CHRONIC PSYCHOTIC PATIENTS: A CONTROLLED TRIAL

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INTRODUCTION

RESERPINE is one of the active alkaloids extracted from the root of the plant, *Rauwolfia Serpentina*. The physiological changes resulting from the use of the drug in animals—such as hypotension, bradycardia, sedation, increased peristalsis, meiosis, etc.—are probably the result of a central action. The precise sites are not known although it seems likely that one of them is the midbrain reticular formation. There is no evidence of any peripheral action, nor of any direct effect on the cortex. The reason for the long latent period, before the drug begins to show an action is still obscure (Lancet Leader, 1955; Moyer, 1955; Plummer *et al.*, 1954). The recent work on the pharmacological relationships between Reserpine, Serotonin and the hallucinogens suggests interesting possibilities (Pletscher *et al.*, 1955; Shore *et al.*, 1955).

There is already a considerable literature on the toxic effects of Reserpine, the most serious of which are Parkinsonism, of a post-encephalitic type, and severe depression (Achor *et al.*, 1955; Barsa and Kline, in press; Locket, 1955; Schroeder and Perry, 1955; Stead and Wing, 1955).

As is usual with new drugs, especially in psychiatry, published reports on the efficacy of Reserpine have included a number which express considerable optimism and enthusiasm as to its effects. Most trials, however, have not included control groups, and few details of the previous social environment, or of methods of assessment of improvement have been given. Such studies have been valuable in stimulating interest and further work. Most observers agree that the drug has a quietening, calming effect without hypnosis, and increases sociability and friendliness in those patients who improve on it. It has so far not been possible to predict those who will benefit by consideration of age, sex, diagnosis, etc.—although it is clear that certain patients (e.g. those suffering from depression) are very rarely helped (Barsa and Kline, in press; Glynn, 1955; Noce *et al.*, 1954).

A few controlled studies are, however, now available. Of these, two deal with out-patients receiving small doses of Reserpine. One shows moderately good results (Davies and Shepherd, 1955); the other does not show any marked therapeutic effect (Folkson and May, 1955). A trial in an American State Mental hospital was encouraging, although there, the control patients were not in the same ward as the treated patients which may have had an important influence on the results (Kline, 1954). A more recent, well controlled study of disturbed long-stay patients failed to demonstrate any significant change between the group receiving Reserpine and the groups receiving a placebo tablet, or no tablet at all. All groups improved significantly from their original condition. Unfortunately only 2 mg. daily of Reserpine were given in this trial, and this dose may have been insufficient to demonstrate a Reserpine effect (Somerness *et al.*, 1955).

It is evident that in psychiatry, the design of adequate drug trials is particularly difficult (Bradford Hill, 1951; Green, 1954; Lasagna, 1955). A recent

article has pointed out that most of these difficulties arise from our ignorance of the aetiology and pathophysiology of the functional psychoses (Clancy *et al.*, 1955). No consistent symptoms or signs or demonstrable physiological changes are available which would enable a confident diagnosis to be made or which could be used for an objective assessment of improvement. Cases must be diagnosed and assessed, therefore, almost entirely on observable behaviour, including what the patient himself says about his illness. As the behaviour of a chronically ill patient may be due to a large number of factors both internal and external, it is extremely important to hold at least the external factors constant and (since this is not completely possible) to provide some sort of measure of the interacting social variables.

PRESENT STUDY

Material

The most "disturbed" long-stay male and female wards were used in this experiment. The patients were all originally sent to these wards because of aggressive, overactive behaviour. Their prospects of improvement were considered to be remote. The female ward had received considerable attention for the three months preceding the trial. An attempt had been made to reduce the use of sedation, seclusion and E.C.T. to a minimum. Aggressive behaviour was discouraged by increased occupation and recreational facilities. It is worth noting that these social changes alone produced a general improvement in behaviour (see also Freudenberg, *in press*). Even the change in routine occasioned by a three-day treatment for scabies for the whole ward had an effect—the staff unanimously reported three of the quietest days they had ever known. During these three months a sociologist was present on the ward for long periods of time each day. His presence seemed to cause a startling drop in the amount of noise and disturbance, until he ceased to be unfamiliar to the patients.

The male ward presented a somewhat different picture. Very little sedation and E.C.T. had been used there, but order was maintained by experienced nurses who kept a stricter discipline and ensured more uniformity of behaviour than on the female ward. No changes were made here before the trial began.

During the period of the trial no further social changes were attempted on either ward. With one or two minor exceptions, the staff remained the same on each ward. No patients were admitted or discharged during the experiment, apart from one male patient admitted just after the beginning and two who discharged themselves during the trial. Staff meetings were held to explain the purpose of the experiment and to stress the need for objectivity in assessments.

There were 25 patients in the male ward and 50 in the female ward.

Altogether 51 patients completed the full course of tablets (17 men and 34 women). The average stay in hospital was $8\frac{1}{2}$ years (varying from 1–25 years). The average age was 37 years (ranging from 20–65, although only 5 patients were over 50).

The diagnostic categories were as follows:

Paranoid schizophrenia	..	..	..	..	..	9
Schizophrenia of other types	..	..	..	..	..	25
Recurrent mania	..	..	..	..	..	4
Epilepsy	..	..	..	..	..	4
Epilepsy with schizophrenia	..	..	..	..	..	6
Patients with psychopathic personalities (with hysterical and aggressive features)	..	..	..	..	..	3

Various treatments had been used in the past:

									<i>Patients Treated</i>
E.C.T.	..	..	..	..	..	..	..	..	47
Deep insulin	..	..	..	..	..	..	..	..	4
Chlorpromazine		..	..	..	..	..	..	..	10
Leucotomy	..	..	..	..	..	..	..	..	9

Twenty-four patients were not included in the trial for the following reasons:

Ten females had been used for the preliminary trial.

Nine patients refused tablets. Eight of these remained unchanged and 1 became more co-operative and sociable by the end of the experiment.

Two patients were on leave when certain records were made. They were both in Group C. One improved a little while on the drug and relapsed afterwards. The other showed no change.

Two male epileptics took their own discharge—1 near the beginning and 1 towards the end. The latter was on control tablets and had shown no change.

One male patient on control tablets became so disturbed that he had to be given other treatment.

Preliminary Trial

A preliminary trial was carried out using 10 of the most disturbed patients from the female ward (not included in the 51 patients listed above).

These were:

Four paranoid schizophrenics

Four schizophrenics of other types

Two aggressive psychopaths.

They had all received many E.C.T. and much heavy sedation in the past and 5 had had leucotomies. 15 mg. Reserpine was given daily, the dose being gradually reduced to 3 mg. daily. Treatment was continued for three months. Considerable improvement occurred in 6 out of the 10 cases, mostly in the direction of increased sociability and reduction of tension and aggression. There was no control group for comparison and these patients were obviously singled out for more attention than the rest of the ward. The nursing staff were very enthusiastic about the results, especially as the rest of the patients seemed to be less disturbed as a consequence of the improvement in these ten. It was considered worth while to proceed to a full trial.

Design

The patients were divided into four groups matched for age, sex, amount of aggressive behaviour, sociability and deterioration in habits. The epileptics were evenly divided but otherwise diagnosis was not taken into account.

Patients were given either Reserpine or control tablets as follows:

Group	First 6 weeks	Second 6 weeks
A	R	R
B	C	C
C	R	C
D	C	R

R=Reserpine

C=Identical control tablets

The constitution of each group was known only to the statistician and the pharmacist.

The trial lasted twelve weeks to allow for any cumulative effects. In the first three weeks, 6 mg. orally of Reserpine was given, and in the second three weeks, 15 mg. orally, daily. In the second half of the experiment these doses were repeated in the same order.

In spite of these efforts to achieve a cast-iron control group, the side effects of Reserpine made it easy to distinguish between the drug and the placebo in the majority of cases. An attempt was made to simulate the characteristic flushing by giving each patient nicotinic acid; however, the trembling and lethargy could not be disguised.

Just as important, but less obvious, was the fact that an improvement in one group produced a change in the social environment of the whole ward. This point is extremely difficult to provide for in an experiment of this kind. If the groups are kept in separate environments, even more problems are created. For example, the female and the male wards in this trial were not comparable.

Methods of Assessment

Since a general judgment of "better" or "worse" is open to such wide subjective interpretation, as many aspects of behaviour as possible were rated separately, and always by more than one observer. The variables used were as follows:

(a) *Fergus Falls Behaviour Index*. This was chosen because of its applicability to chronic psychotic patients (Lucero and Meyer, 1951; Meyer and Lucero, 1953). The two senior nurses on each ward rated each patient on ten selected items. The marks ranged from 1 to 5 increasing with improvement. A behaviour index could be calculated for each patient.

The final assessment was made by averaging the four indices obtained during the two weeks before the trial started, the fifth and sixth weeks and the eleventh and twelfth weeks.

(b) *The Sociologist's rating on the Fergus Falls Chart*. Here ratings were made on fewer variables. His results are given separately.

(c) *Weekly assessment of improvement*. Each week both senior nurses on each ward rated the patients on their general condition as compared with the previous week. A five-point scale was used, -2 (much worse), -1 (worse), 0 (unchanged), +1 (better), +2 (much better).

For each six week period the two sets of ratings for each patient were summated and averaged. The number of patients showing overall improvement in each group during these periods was recorded.

(d) *Assessment of improvement in the middle and at the end of the experiment*. On each ward the four most senior nurses and the Sociologist were asked to rate the patients on the five-point scale above. They assessed change in (d.1) general condition, (d.2) aggression, (d.3) tension, (d.4) sociability, (d.5) habits, (d.6) delusions, and (d.7) hallucinations. The patient's condition in the middle of the experiment was compared with that at the beginning. At the end, his condition was compared with that in the middle and at the beginning.

The five results were averaged for each variable. The number of patients showing overall improvement was recorded.

(e) *Mental state rating*. The female patients were very well known to the ward doctor, who assessed the change in their mental state on the same five-point scale, comparing the middle with the beginning and the end with the

beginning. The variables assessed were (e.1) general mental state, (e.2) ability to converse rationally, (e.3) emotional contact, (e.4) hostility, (e.5) delusions and (e.6) hallucinations.

The numbers of patients showing improvement were recorded.

The male patients were not assessed by the doctor.

(f) *Numbers of patients involved in incidents.* An "incident" was defined as an outburst of aggressive behaviour which necessitated the interference of a nurse to control it.

The numbers of patients involved in incidents in the two weeks preceding the investigation, the fifth and sixth, and the eleventh and twelfth weeks were recorded.

(g) *Numbers of patients given paraldehyde.* During the trial, the only other drug used was paraldehyde. This was given in order to stop aggressive behaviour which could not be controlled by other means. The numbers of patients receiving paraldehyde during the three two-weekly periods were recorded.

(h) *Weight.* Each patient was weighed on the same machine, in a dressing gown, two hours after a light evening meal. This was done before the experiment, halfway through and at the end. The weighing of the female patients was supervised by the ward doctor, and that of the male patients by a senior male nurse.

(h.1) The average gain in weight for each group was calculated.

(h.2) The number of patients showing a gain of 3 lbs. or more in each six-weekly period was recorded.

(i) *Blood pressure.* This was taken at the beginning, middle and end. The readings were not made under standard conditions and are not suitable for statistical analysis.

Records were also kept of occupation, parole, opinions of relatives, etc.

RESULTS

Variables a, b and h.1 were tested by Analysis of Variance. Variables f and g were evidently not significantly different by inspection.

Initially the groups did not differ significantly on any of the relevant ratings, though certain significant differences were noted between the sexes. Weight showed the expected difference. The numbers of patients involved in incidents and taking paraldehyde were greater on the male ward. This seems to be contrary to the common finding that women patients are more disturbed than men. However, in this ward the 10 most disturbed women had been included in the preliminary trial and do not contribute to these figures. The incidents were not distributed to a Gaussian curve—the 10 patients all accounting for a large number. The full total for the female ward was much higher than for the men.

Variables a, b and h.1 were tested by the t-ratio, and the others by chi-squared or the exact binomial product method.

This table compares the status of the groups halfway through the experiment. At this stage, there are only two groups, treated (A and C) and controls (B and D). Certain differences stand out.

(i) Very significantly more of the treated than of the control group show a mean improvement in tension (d.3) and sociability (d.4).

(ii) According to the weekly improvement chart (c) significantly more of the treated than of the control group show a mean improvement.

(iii) Among the female patients significantly more of the treated group

TABLE I
Initial Status of Groups and Sexes

Variable	Group Means and Counts				No. of Patients in Each Group				Signifi- cance of Group Differ- ences		Sex Means and Counts		No. of Patients of Each Sex		Signifi- cance of Sex Differ- ences
	A	B	C	D	A	B	C	D			M	F	M	F	
a	2.60	2.58	2.89	2.60	13	11	14	13	NS	NS	2.89	2.57	17	34	NS
b	3.02	3.60	3.40	2.76	11	8	13	12	NS	NS	3.20	3.00	16	28	NS
f	9	8	8	8	13	11	14	13	NS	NS	13	20	17	34	5%
g	5	4	3	5	13	11	14	13	NS	NS	12	5	17	34	1%
h.1	125.75	128.60	135.79	126.69	12	10	14	13	NS	NS	143.24	122.12	17	32	1%

NS = not statistically significant.
 5% = significant at or beyond 5% point or level.
 1% = significant at or beyond 1% point or level.
 T = treated.
 C = control.
 M = male.
 F = female.

TABLE II

Halfway Assessment of Treated and Control Patients

Variable	Group Means and Counts		No. of Patients in Each Group		Significance of Differences
	T	C	T	C	
a	2.90	2.65	27	24	NS
b	3.09	2.82	24	20	NS
c	20	9	27	24	5%
d.1	19	10	27	24	NS
2	19	10	27	24	NS
3	20	8	27	24	1%
4	20	8	27	24	1%
5	13	8	27	24	NS
6	4	1	27	24	NS
7	3	0	27	24	NS
e.1	8	1	17	17	5%
2	6	1	17	17	NS
3	7	1	17	17	5%
4	6	0	17	17	5%
5	4	0	17	17	NS
6	1	1	17	17	NS
f	9	8	27	24	NS
g	5	6	27	24	NS
h.1	137.69	128.74	26	23	NS
2	24	11	26	23	5%

show an improvement in general mental state (e.1), emotional contact (e.3) and hostility (e.4).

(iv) Significantly more of the treated than of the controls show an increase in weight (of more than 3 lb.).

On no rating does the control group show a significant improvement.

TABLE III

Final Assessment of Groups

Variable	Group Means and Counts				No. of Patients in Each Group				Significance of Differences
	A	B	C	D	A	B	C	D	
a	3.03	2.90	3.16	2.87	13	11	14	13	NS
b	3.19	3.19	3.29	2.86	11	8	13	12	NS
c	6	7	11	7	13	11	14	13	NS
d.1	11	4	9	9	13	11	14	13	5 per cent
2	8	5	9	7	13	11	14	13	NS
3	12	5	9	8	13	11	14	13	5 per cent
4	10	3	9	10	13	11	14	13	5 per cent
5	4	4	5	8	13	11	14	13	NS
6	5	0	4	5	13	11	14	13	5 per cent
7	4	1	4	3	13	11	14	13	NS
e.1	6	1	2	1	8	8	9	9	5 per cent
2	3	1	3	1	8	8	9	9	NS
3	4	1	3	1	8	8	9	9	NS
4	5	0	1	0	8	8	9	9	5 per cent
5	2	0	2	1	8	8	9	9	NS
6	1	1	0	0	8	8	9	9	NS
f	2	3	3	4	13	11	14	13	NS
g	4	1	0	2	13	11	14	13	NS
h.1	135.58	131.80	139.21	132.23	12	10	14	13	NS
2	12	8	11	10	12	10	14	13	NS

Variables a, b and h.1 were tested by Analysis of Variance, and the others by the exact binomial product method except where there were sufficient cases for chi-squared to be used.

Table III compares the status of the groups at the end of the trial. There are now four groups with smaller numbers in each group. Differences between groups are therefore not so clear cut statistically.

(i) Compared with their condition at the beginning significantly fewer of Group B than of the other three groups show a mean improvement in general state (d.1), tension (d.3), sociability (d.4) and delusions (d.6).

(ii) Significantly more of Group A than of the other three groups showed an improvement in general mental state (e.1) and hostility (e.4).

This seems to suggest that there is a cumulative improvement from using the drug for three months.

Dixon Mood Sign Test

TABLE IV

Halfway Compared
to Initial

Variable	T	C
a	1%	NS
b	NS	NS
c	—	—
d. 1	1%	NS
2	1%	NS
3	1%	NS
4	1%	NS
5	5%	NS
6	NS	NS
7	NS	NS
e. 1	1%	NS
2	5%	NS
3	5%	NS
4	5%	NS
5	NS	NS
6	NS	NS
f	5%	1%
g	NS	NS
h. 1	1%	NS

TABLE V

Final Compared
to Initial

Total	A	B	C	D
1%	5%	5%	NS	1%
NS	NS	NS	NS	NS
—	—	—	—	—
1%	5%	NS	NS	NS
1%	5%	NS	NS	NS
1%	1%	NS	NS	NS
1%	1%	NS	NS	5%
5%	NS	NS	NS	NS
5%	NS	NS	NS	NS
5%	NS	NS	NS	NS
5%	NS	NS	NS	NS
—	5%	NS	NS	NS
—	NS	NS	NS	NS
—	NS	NS	NS	NS
—	NS	NS	NS	NS
—	NS	NS	NS	NS
—	NS	NS	NS	NS
1%	5%	5%	5%	5%
1%	NS	NS	NS	NS
1%	1%	NS	NS	NS

TABLE VI

Final Compared
to Halfway

Total	A	B	C	D
1%	5%	5%	NS	5%
NS	NS	NS	NS	NS
—	—	—	—	—
1%	NS	NS	NS	NS
1%	NS	NS	NS	NS
1%	NS	NS	NS	NS
1%	NS	NS	NS	5%
5%	NS	NS	NS	NS
5%	NS	NS	NS	NS
5%	NS	NS	NS	NS
5%	NS	NS	NS	NS
—	—	—	—	—
—	—	—	—	—
—	—	—	—	—
—	—	—	—	—
—	—	—	—	—
—	—	—	—	—
NS	NS	NS	NS	NS
NS	NS	NS	NS	NS
NS	NS	NS	NS	NS

These tables set out the significance of changes in time using the Dixon Mood sign test. This test of significance may sometimes give a more favourable impression than would a t-test applied to the same data, especially where there are a few large losses against many small gains, but it is arguable that it more accurately represents the position in such instances. It is applicable to non-Gaussian distributions such as are seen here where a t-test is strictly not applicable.

In Table IV, the status of the treated group halfway through the experiment is compared with its status at the beginning; similarly for the control group. It can be seen that the treated group has improved significantly on the majority of variables. The control group has improved significantly on one variable only—the number of patients involved in incidents (f).

In Table V, the status of the groups at the end of the trial is compared with that at the beginning. The detailed interpretation of this table presents some difficulty, but certain trends are obvious. The total group shows significant improvement on nearly all counts. Group A on 7 counts, B on 2 counts, C on 1 count and D on 3.

In Table VI, the status of the groups at the end of the trial is compared with their status in the middle. Again, the significant improvement of the total group on many counts is clear, but there is little to choose between the individual groups.

Other indices of improvement were as follows:

Ten patients became occupied while receiving Reserpine, who previously had refused to work. One patient who refused tablets of any kind similarly became occupied.

Three patients receiving Reserpine and 1 receiving dummy tablets became suitable for parole.

The relatives of 10 patients receiving Reserpine remarked on increased friendliness and interest in family affairs. Three of these patients began to write letters home after a long period of silence.

Seven treated patients and 1 on control tablets were transferred to open wards after the trial.

TABLE VII

Patients Showing Marked Improvement (I) or Marked Deterioration (D)

Group	Medial		Final	
	I	D	I	D
A	2	0	6	1
B	1	1	1	0
C	4	0	5	0
D	0	0	3	1

When the results of all scales for each patient were examined, it was seen that certain individuals showed a *marked* improvement or *marked* deterioration on more than half of the scales used. These patients were the ones who showed most change according to the clinical impression of the medical and nursing staff.

Of the patients who were much improved according to these criteria, only 2 were men. This may possibly be related to the fact that the female nurses made more use of any improvement that occurred by encouraging social activities, etc.

Both the patients who became worse while on the drug were very hypochondriacal and were upset by the unpleasant side effects they experienced (see also Sarwer-Foner and Ogle, 1955).

Side Effects

The immediate effects were flushing, trembling, oedema of the face, and nasal stuffiness, which occurred in nearly every case. These gradually became less noticeable after the first week or two, but in all cases facial oedema remained throughout. Increased appetite and thirst were evident from the beginning, as was frequency of micturition. Two patients had ankle oedema. Heavy, stertorous breathing was noticed in 5 cases. Two patients vomited during the first few days; 1 of these had a gastric ulcer but there was no other exacerbation of her symptoms.

Lethargy was very marked especially on the higher doses, but tended to disappear after the first few weeks. Dexedrine was given in 6 cases and proved helpful. Four patients were so lethargic that the dose of Reserpine was reduced, after which the lethargy diminished. Difficulty in focussing on near objects was complained of by 3 patients.

Anxiety was obvious in one-quarter of cases during the first week. Those who could describe their feelings mentioned fears of death, shivering, faintness and general malaise. Four patients repeatedly threw themselves on the floor. Two patients only, complained of nightmares. There was a temporary increase in noise and disturbance during the first two weeks when side effects were at their worst.

Dribbling was noticed in a few patients after one or two weeks. Two were given atropine which produced improvement. Parkinson's syndrome occurred in 6 cases while on 15 mg. daily and in one case on 6 mg. daily. Reduction of the dose improved the symptoms. An oculogyric crisis occurred in 1 case of Reserpine Parkinsonism. It ceased after a few minutes and did not recur.

Two patients had fits for which phenobarbitone was given. They were not previously known to be epileptic. One has continued to have fits since the drug was discontinued.

In 6 patients receiving the drug, the systolic blood pressure was reduced to below 100 mm. Hg without apparent ill effect.

Menstruation began in 3 women who had not had a period for over a year.

No cases of severe depression occurred in this series.

Some of the patients on control tablets reported "side effects". Two complained of lethargy, 1 had ankle oedema and diarrhoea and 2 patients dribbled while on control tablets but stopped when changed to Reserpine.

DISCUSSION

In general these results do indicate a fairly marked Reserpine effect. It is clear, even with the rather subjective methods of assessment used, and in spite of all the difficulties, that, throughout the experiment, the treated groups received more significant ratings of improvement than the control groups.

However, the fact that the staff who were recording changes could infer which patients were receiving the drug weakens the cogency of these findings. This is a problem which may well affect the results of any trial depending on the double blind method of control; the side effects of Reserpine are particularly striking, but many other drugs produce some identifiable physiological change apart from the desired therapeutic effect.

The control groups show a significant reduction in the numbers of patients involved in incidents, both halfway and at the end of the experiment, and Group B shows a significant improvement in the Fergus Falls behaviour chart at the end. Also, the total sample shows a significant improvement on many ratings although the individual groups show no significant change (see Table VI). This may be due to the social effects of performing an experiment which act both on the patients and on the staff. But it could also be partly due to the Reserpine effect, since an improvement in one disturbed patient may easily be reflected in improved behaviour in another patient not receiving the drug. For example, detailed records of the aggressive incidents occurring on the wards show that at least half of them arise from understandable social causes involving other patients (Folkard—personal communication, work to be published; Stanton and Schwartz, 1955).

The Sociologist's behaviour chart ratings showed no significant changes in any of the tables. This may have been due to the fact that as a non-participant observer the Sociologist saw only the typical lethargy which in the first weeks especially seemed to affect the whole ward. This meant that fairly low scores would be given on the items marked on the Fergus Falls chart by this particular

rated. The nursing staff, on the other hand, were active participants in the life on the wards, and they noticed improvement because of the increased friendliness of the patients and their willingness to join in occupations when stimulated to do so, despite their lethargy when left alone.

The results on the whole, suggest that Reserpine may be of value in some aggressive and overactive chronically psychotic patients, primarily as a means of reducing tension and increasing sociability. The relief seems to be symptomatic only and good results are more likely if the treatment is combined with social and psychological measures. The patients who showed most improvement in this trial were diagnosed as having schizophrenia or chronic mania. The aggressive psychopaths and the epileptics without psychosis did not show any increase in friendliness or sociability. The extreme lethargy reduced the number and severity of aggressive outbursts in some cases.

Comparisons with the preliminary trial suggest that reports of dramatic improvements should be viewed with caution, particularly when there is no adequate control, and when the conditions in the wards have hitherto been poor.

The optimum dose in these patients seems to be a fairly high one. Side effects were fewer and less distressing with a dose of 6 mg. daily than with 15 mg. daily. The evidence does not allow any conclusion as to whether the larger dose achieved any better result.

Although detailed records were not kept, it seems that the patients who improved maintained their improvement for one to four months after the trial ceased and then began to relapse. (Treatment with the drug was stopped after the trial.)

SUMMARY

- (1) A controlled trial of the effect of Reserpine in 51 chronic psychotic patients was carried out.
- (2) Assessment of progress was made by using many different variables each rated by 2 or more observers.
- (3) A fairly well marked Reserpine effect was found against a background of improvement in the total group.
- (4) Reserpine appeared to decrease tension and increase sociability in aggressive and overactive chronic psychotic patients.
- (5) Reasons are given why the results should be interpreted with caution.

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RESERPINE ("SERPASIL") IN MENTAL DEFICIENCY PRACTICE

By

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THE therapeutic problems confronting those of us engaged in mental deficiency practice are manifold. This is due to the varied and mixed population inhabiting our hospitals.

There is the group known as "high grade" with intelligence quotients of 75 per cent. upwards who are admitted on account of their social inadequacy due to emotional maladjustment, sexual deviations and other psychopathic behaviour problems. The "low" and "medium grade" with intelligence quotients of 25 to 60 per cent., in addition to their deviant behaviour are intellectually so low that they could not cope outside an institution.

It is the aim of the psychiatrist to rehabilitate the former group and here in our hospital we have a very active programme to accomplish this end. The latter group are, however, an ever-pressing therapeutic problem on account of the frequency of psychomotor excitement, noisiness and destructiveness.

The present study was designed to assess the effectiveness of the new drug Reserpine in controlling deviant behaviour in such mentally defective patients.

PHARMACOLOGY

Reserpine ("serpasil") is the active principle derived from the roots of a small flowering shrub *Rauwolfia serpentina* Benth, found principally in India, Java, Africa and other tropical countries.

In India preparations of *Rauwolfia* have been in use medicinally from ancient times for the treatment of a variety of conditions including insomnia, nervousness, insanity and snake bites. Its use on a world wide scale has only been a very recent event. The empirical formula of *Rauwolfia serpentina* is $C_{33}H_{40}O_9N_2$ and its chemical properties are in agreement with the following proposed structure:

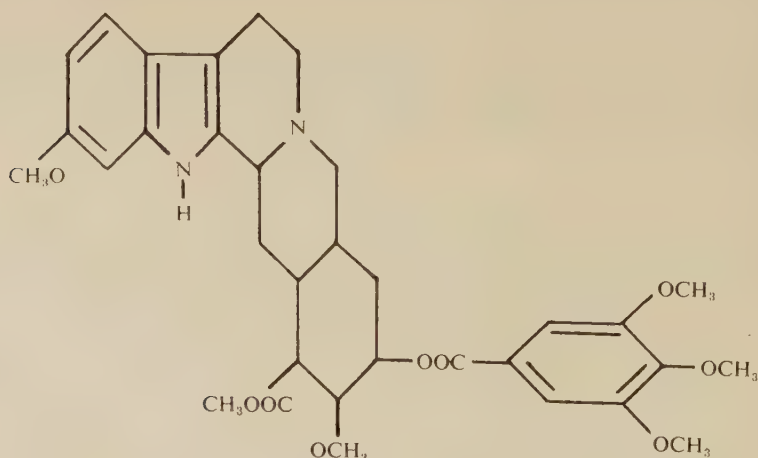


FIG. 1.—Structural Formula of "Serpasil".

The mode of action of Reserpine has been under intensive investigation (Bein *et al.*, 1953; Plummer, Earl, Schneider, Trapod and Barrett, 1954) since Muller *et al.* (1952) identified this crystalline alkaloid from the crude extract of *Rauwolfia serpentina* Benth.

METHODS

The entire investigation was conducted in the building that houses 68 of our most difficult patients. This villa is divided into two completely self contained units, each containing 34 patients. This block was chosen because the ward population is relatively stationary, the patients are the most troublesome and difficult to manage, and the Sisters in charge are never changed, so that even minor alterations in the patients' behaviour would be noticed and recorded.

SELECTION OF PATIENTS

From the 68 a group of 22 of the most inaccessible, noisy, aggressive and destructive patients were chosen; their ages varying from 11 to 57 years; their degree of mental defect being of the feeble-minded and imbecile grade. Superimposed upon the defect 7 are schizophrenic, 3 have manic episodes and 12 do not show any psychotic traits, but 7 of the latter are, in addition, epileptic.

PROGRAMME OF TREATMENT AND CONTROL

Since it is virtually impossible to get patients with identical behaviour problems and similar physical qualities for control purposes, the following procedure was adopted. Each patient received an 0.25 mgm. tablet t.d.s. for a period of three months. These were then replaced by identical "dummy" tablets. No one except myself was aware of the change. After a period of two months the active tablets were once again administered. Knowing the hypotensive action of the drug, the blood pressure was recorded twice weekly for the first two months, once weekly for the next two months and once monthly thereafter. Weekly reports were obtained from the Sisters of the morning and afternoon shifts and the night Sister kept a special record of screaming fits during the night and early morning.

RESULTS

For purposes of assessment each patient was placed in one of three groups, namely, "improved", "much improved" and "unchanged".

The group "much improved" comprises those patients who became more accessible, no longer aggressive and generally socially more integrated to the extent that they were able to attend the Occupational Therapy Department. Delusions and hallucinations, though still present, do not dominate the whole of the patient's life.

The "improved" group refers to patients whose tendency to impulsive behaviour, noisiness, destructiveness and hyperkinesis has been reduced to a degree where recourse to such therapeutic measures as paraldehyde and other forms of sedation, and particularly single room treatment are no longer necessary.

CASE REPORTS

Case 1. History:

A feeble-minded female aged 40 years, who was admitted to this hospital in 1940. At that time she was capable of holding a reasonably intelligent conversation, and was quite well orientated. In 1941 she proceeded on licence, but had to be returned to the hospital a year later

because she was unmanageable. She deteriorated progressively, developing hallucinations and delusions, finally she completely withdrew from her surroundings, losing interest in everything and everybody. She became aggressive and would strike anyone who tried to make contact with her.

Treatment: She was given 0.25 mgm. tablets of "serpasil" t.d.s. A fortnight after the commencement of treatment she began to take interest in her surroundings, she would listen to the radio, smile and answer questions. The greatest surprise to us all was when she asked for a cigarette and to go to the "pictures"—something she had not done for years.

Control period: About three weeks after the administration of the control tablets, the patient began to show signs of deterioration. She became unco-operative, irritable and aggressive. Within six weeks she reverted to her former state. A fortnight after the active tablets were exhibited the patient improved once again. She is now in the Occupational Therapy Department doing some very nice work, and what is more important, she is quiet, happy and relaxed. She has continued in this state for the past four months on the above dose, i.e. 0.75 mgm. daily divided in three doses.

Case 2. History:

A female epileptic imbecile, aged 35 years. Admitted to this hospital in 1950. She was extremely noisy and aggressive with frequent outbursts of psychomotor excitement, when she attacked anyone in her path. In her quiet moments she was destructive to clothing. She had to be sedated, and warded in a single room quite regularly.

Her behaviour both during the treatment and the control periods was similar to the above case. She has remained much improved for the past four months on the same dosage. In addition, her epileptic fits have diminished, both in frequency and severity. The other cases including the two above mentioned, are summarized in the accompanying table.

Summary of Results

Condition	Much Improved	Improved	Unchanged	Total
F.M.+Schizophrenic patterns ..	4	2	1	7
F.M.+Manic episodes ..	3	—	—	3
F.M.+Epilepsy—3 patients ..	4	2	—	6
Imbecile+Epilepsy—4 patients ..	3	2	1	6
Totals: 7 epileptic patients ..	14	6	2	22

DISCUSSION

It would appear from this study that "serpasil" has a definite, continuous and lasting beneficial effect on difficult mentally defective patients. While this investigation consists only of 22 patients and further study on a larger sample is undoubtedly desirable, it is, nevertheless, significant that 14 patients showed great improvement, 6 improvement, and only 2 out of the total of 22 remained unchanged.

A number of interesting observations emerged from this study, apart from the tranquillizing effect of "serpasil" the drug may be given in conjunction with other drugs, e.g. anticonvulsants. Good results are obtained in small doses which can be given apparently indefinitely. Toxic effects were not encountered in this study. One patient developed an allergic rash which might have been coincidental, in any case it cleared up with anti-allergic treatment.

That the action of "serpasil" is on the hypothalamic centres (Bein, 1953) appears consistent with this study, since an outburst of excitement when it does occur always coincides with a rise in blood pressure, together with other signs of autonomic dysfunction.

The epileptic fits in three patients diminished in both frequency and severity, while in the remaining four, the severity of the fits only was effected. "Serpasil" does not, however, replace anticonvulsants.

Arising from the improvement of "serpasil" therapy, the decorum in the ward has greatly improved, and the single room is rarely, if ever, used. In these days of shortage of nursing staff, this drug may prove of immense value to those of us engaged in mental deficiency practice.

SUMMARY

The results and observations of "serpasil" therapy in 22 most unmanageable patients are presented. The physical set up and methods of study are described.

Fourteen of the patients were much improved, 6 improved and 2 remained unchanged.

The fits in 3 of the epileptic patients diminished in frequency and severity and in the remaining 4 in severity only.

ACKNOWLEDGMENTS

I wish to thank Dr. D. H. H. Thomas, Medical Superintendent, for constant encouragement and advice; Ciba Laboratories Limited for a very liberal supply of "serpasil" and control tablets; and the nursing staff for their co-operation and invaluable help.

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THE INFLUENCE OF RESERPINE ON A DISTURBED MALE WARD AND A METHOD FOR ASSESSING THIS

By

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and

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WHEN we commenced using reserpine in our disturbed male ward we were impressed by the calming effect which this produced in many of the patients and by the fact that the ward as a whole became quieter. In order to confirm these impressions we created a method which enabled us to express the behaviour of the patients in a graph. We thus had a simple means of comparing one clinical state with another and of assessing the influence of the therapeutic measures used.

In using this method we considered six factors as determining the conduct of our patients:

- | | |
|----------------------|----------------------|
| 1. Anxiety | 4. Paranoid attitude |
| 2. Social adaptation | 5. Mood |
| 3. Aggressiveness | 6. Intelligence |

We then evaluated the degree in which each of these factors was present in the following way:

- | | |
|-----------|-------------|
| 0. Nil | 2. Moderate |
| 1. Slight | 3. Extreme |

From this evaluation resulted the next classification:

Anxiety:

0. The patient feels anxious only when facing real danger, but does not discuss his fears with others.
1. The patient speaks spontaneously about well founded fears.
2. The patient suffers intermittently from unfounded fears.
3. The patient is in a continuously anxious state.

Social Adaptation:

0. The patient secludes himself from society.
1. The patient does not look for contact spontaneously, but responds readily to overtures.
2. The patient turns to the group spontaneously and is accepted by it.
3. The patient is a valued member of the group.

Aggressiveness:

0. The patient does not react even to strong noxious physical stimuli.
1. The patient reacts verbally to noxious physical stimuli.
2. The patient reacts with physical aggression to noxious verbal stimuli.
3. The patient has spontaneous outbursts of violent physical aggression.

Paranoid Attitude:

0. The patient is not paranoid.
1. The patient is suspicious without formulating the reason why.
2. The patient always makes enquiries why and has a paranoid glance.
3. The patient has paranoid delusions.

Mood:

0. The patient is depressed.
1. The patient suffers from emotional lability.
2. The patient is normal.
3. The patient has a manic or hypomanic mood.

Intelligence:

0. The patient suffers from idiocy and imbecility.
1. The patient suffers from feeble-mindedness.
2. The patient has an average intelligence.
3. The patient has a superior intelligence.

Thus we composed a graph of a normal person in the following way:

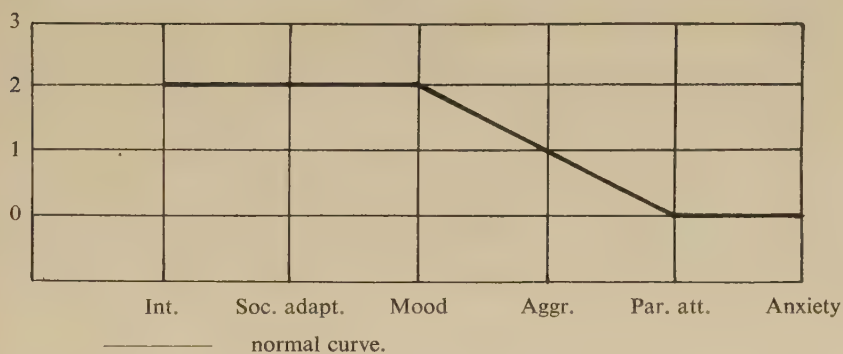


FIG. 1.—Behaviograph I: normal curve.

Let us first give an example of the behaviograph from a case of catatono-paranoid schizophrenia:

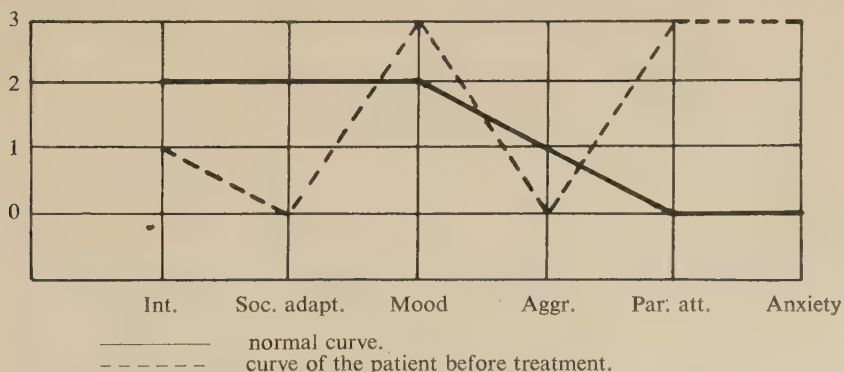


FIG. 2.—Behaviograph II: catatono-paranoid schizophrenia before treatment.

This method having proved efficient, we compared the behaviour of the patients in our 23-bed ward for agitated male patients during reserpine therapy with their behaviour the previous year, when reserpine was not yet in use. A survey of that ward was therefore made during the period 1 August till 31 October, 1954; it was repeated during the same months in 1955.

Our survey included all the patients mentioned in the ward notebooks during the period in question, and covered 48 patients in 1954, 46 patients in 1955. Their stay in the ward lasted not less than one week, and in some cases, three months or longer. The same number of patients was given, during both periods, insulin-shock therapy and largactil treatment, while during August–October, 1955 about one-third of the ward patients received reserpine treatment.

One mgm. reserpine tablets (a product of the Teva Pharmaceutical Industry, Jerusalem) were used. The patients received from 4 to 30 mgm. daily for periods varying between three weeks and three months.

This method enabled us to express the behaviour of the patients in the form of graphs; by first scoring the behaviour of each patient separately, and then averaging the results for the whole ward, it was possible to obtain a complete general picture of the ward condition.

The results are summed up in the following graph.

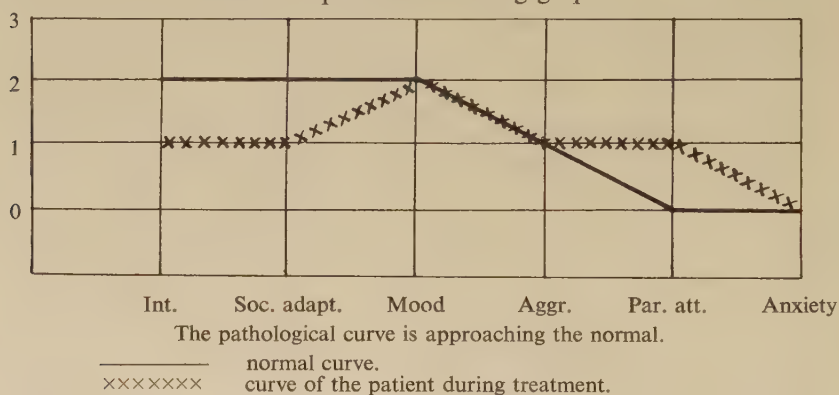


FIG. 3.—Behaviograph III: the same patient during insulin and largactil treatment.

DISCUSSION

Examining the results of our investigation we see in Behaviograph IV a remarkable decrease in the paranoid attitude, the anxiety and the aggressiveness.

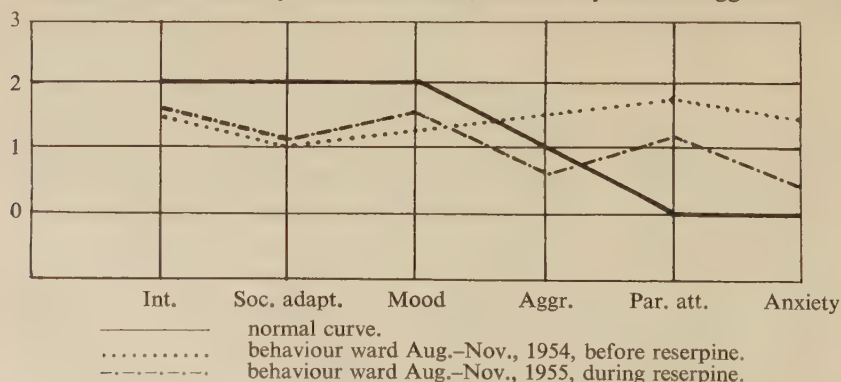


FIG. 4.—Behaviograph IV; behaviograph of the whole ward.

One would expect an equal increase in the social adaptation. That this is not so can be explained in the following way: social adaptation grade one means per definitionem that the patient does not look for contact spontaneously. This looking for contact has nothing to do with the agitated impression made by the ward. Thus we should not be surprised that there is no considerable change in the social adaptation. However, improvement in the quality of social adaptation is facilitated by the above changes in the clinical state and now can be achieved more easily by psychotherapy.

Our method is probably not sufficiently exact to demonstrate that reserpine does not depress the mood to the extent mentioned in the literature.

SUMMARY

(1) In order to show the influence of reserpine on the atmosphere of an agitated male ward of a psychiatric hospital, we made a comparison of that, before and after, reserpine treatment.

(2) Toward this purpose we used a method permitting the expression of the clinical behaviour in a graph.

(3) As a result of our investigation we found a remarkable decrease in the paranoid attitude, the anxiety and the aggressiveness of the patients. Improvement in the quality of social adaptation is facilitated by the above changes in the clinical state and can now be achieved more easily by psychotherapy, a fact on which we will report at a later date in greater detail.

ACKNOWLEDGMENTS

We are indebted to Professor Dr. H. Z. Winnik for his interest and co-operation and to Dr. S. Davidson for his helpful criticism and for reading the manuscript.

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A CHARACTERISTIC FORM OF OVERACTIVE BEHAVIOUR IN BRAIN DAMAGED CHILDREN

By

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BEHAVIOUR disorders resulting from localized lesions of the brain have attracted increasing attention recently. With the rapid progress being made in neuro-surgical treatment there is a prospect that their accurate diagnosis may become more than an academic exercise. In the present paper a description will be presented of characteristic overactive behaviour which appears, in the majority of cases, to be due to cortical damage, frequently involving the temporal lobe, and sustained either at the time of birth or in later childhood.

The behaviour symptoms exhibited were remarkably constant throughout the series of twenty-five children studied. There was marked restlessness, distractibility and an inability to concentrate for more than a few seconds at a time. The affected children showed an apparent compulsive need to touch every object which they saw, and to suck or chew them. Outbursts of aggressive and irresponsible behaviour occurred frequently, and the patients seemed to be incapable of responding to reprimand or chastisement for longer than a few minutes. The majority suffered from epilepsy or showed other evidence suggesting the presence of cerebral damage on examination.

SELECTION OF PATIENTS, AND METHODS OF EXAMINATION

Thirty-one patients with the type of behaviour described above have been seen in the past three years in the Royal Hospital for Sick Children, Edinburgh, and in a number of local schools, residential homes and institutions. The majority were referred on account of behaviour disorders, epilepsy, neurological symptoms, or because of failure to make progress at school. In six patients the histories were inadequate for analysis, or the facilities for detailed examination were lacking. These cases are therefore excluded from the series of twenty-five patients whose findings will be described.

Detailed histories of the family backgrounds of the patients were taken, special attention being paid to the presence of any psychiatric or neurological symptoms amongst parents or siblings.

Mothers were closely questioned about the patient's prenatal, natal and neonatal history, and whenever possible their answers were supplemented by reports from attending doctors and by notes from Maternity Hospitals. A careful history was obtained of the child's physical development, and any illness he had suffered. Descriptions of the child's behaviour at different ages were obtained from parents, other relatives, teachers, local doctors, and from the notes of any hospitals to which he had been admitted.

The children were observed at play for as long as possible on a number of occasions, preferably in different environments and with different people present. Some children, for example, were examined at home, at school, and in the In-patient and Out-patient departments of the Department of Psychological Medicine in the Royal Hospital for Sick Children. Every child was submitted

CONGENITAL CASES

No.	Sex	Age When Examined	Milestones		Family History	Probable Origin of Brain Damage	Behaviour Symptoms	Epilepsy	Examination	Intellectual Assessment	EEG
			First Walked	Said First Words							
1	M	9	14	20	Mother paranoid.	Firstborn of twins. Prolapsed cord 10 hours before delivery by Willett's forceps. B.W.—5 lb. 9 oz. Ten minutes apnoea.	Teachers report: "Irrepressible, irresponsible and quite incapable of concentration." Excluded from three schools in two years.	None.	Right hemiplegia. Aphasia. Speech defect. Right-sided neglect.	I.Q. "Probably about average" on test.	Generalized theta activity, but no focus found.
2	M	8	24	24	Father epileptic.	Prolonged labour. Thirty-two hours second stage. Severe apnoea followed by jaundice and proctorrhoe for 3 days. B.W.—8 lb.	Can watch television. Play with fingers or suck them for up to 15 minutes, but always on the move. Overactivity evident from age of 2 years especially.	None.	Left hemiplegia. Cerebellar ataxia. Retarded speech development.	I.Q. "Borderline between dull and backward, and high grade defective" on test.	Would not co-operate. Reading unsatisfactory.
3	M	6	18	18	Father's cousin epileptic.	Mild pre-eclampsia in pregnancy. Mid cavity forceps through contracted outlet with "considerable traction". Prolonged apnoea followed by convulsions. B.W.—8 lb. 14 oz.	Has always been in too much of a hurry to learn, and is into everything with his clumsy hands.	Right-sided clonic convulsions, with loss of consciousness once or twice a year.	Right hemiplegia. Cerebellar ataxia.	I.Q. "In the dull and backward group."	Too restless for accurate recording.
4	M	6	12	36	Normal.	Mother unconscious for 2 hours on day before delivery as a result of accidental co. poisoning. No foetal movements or heart sounds thereafter.	From age of 2½ has been becoming more and more fidgety, destructive and demanding. Is now out of control.	Grand mal with prodromal hallucinations two or three times a week.	Mild right hemiplegia with aphasia and stutter.	I.Q. One hundred and five on Terman Merrill test scale.	Moderate amplitude delta waves from left temporal focus.
5	M	6	13	12	Normal.	Very difficult forceps delivery through contracted mid pelvis. Apnoea for 5 minutes. B.W.—5 lb. 12 oz.	Since 15 months old unable to keep still, and since 2½ has been the terror of the street. At his worst he even eats his bedclothes.	Grand mal every three to six months.	Mild left hemiplegia.	I.Q. Ninety-five on Moray House Group Test.	Generalized delta waves with right parietal focus.
6	F	6	13	22	Normal.	Delivered by Caesarean section after 48 hours in labour. Very severe apnoea (at least 20 minutes). Thereafter "cerebral". B.W.—7½ lb.	Headstrong, wilful and putting her fingerprints on everything. The only thing she has not time to put into her mouth is food.	None.	Normal findings. Clumsy.	I.Q. One hundred on Merrill Palmer.	Very restless. Poor record, but probably not without normal limits.
7	M	7	13	18	Normal.	Unknown, but breech-presented. Delivered spontaneously. No apnoea. B.W.—7 lb. 7 oz.	Boisterous from 2 years old. Started getting leatherings from 3. Played wild from 3 years old onwards. Three schools in two years.	None.	Mild left hemiplegia with left homonymous field defect.	I.Q. One hundred and seventeen on Terman Merrill.	Satisfactory recording could not be obtained.
8	M	8	18	11	Two siblings died polycystic kidneys. One also had subdural haemorrhage.	Unknown. Delivered by Caesarean section.	From 3 years old has been a "fiddler". If he had been able to see better perhaps he would not have need to touch everything so much.	None.	Mild right hemiplegia. Aphasia. Homonymous right field neglect. Myopia.	I.Q. scores on WISC Scales: 97 Verbal, 78 Performance.	High amplitude delta waves from both hemispheres. No focal activity.
9	F	9	13	24	Brother epileptic.	Unknown, but pre-eclampsia in pregnancy. "Pett mal" from 6 months old, until age 18 months.	From 2 years old she has been running about. Cannot even be left with carpets or cushions, or she will chew them.	Grand mal once or twice each year, from age 2½ years.	Moderately severe ataxic diplegia.	Grossly defective. Idiot.	Not done.
10	F	7	14	24	Unknown.	Unknown.	From 1 year old or less failed to pay attention to anyone talking to her. Chewing of clothes and sheets.	None.	Mild ataxic diplegia.	I.Q. One hundred and thirty-three on Collins and Drever performance test.	Not outwith normal limits, but very restless.
11	M	11	12	16	Aphasic twin.	Premature twin delivered by breech with difficulty. Severe apnoea and neonatal cyanosis. B.W.—5 lb. 7½ oz.	Jumped from one thing to another. Could not keep still from 2 years old. Gets up and walks about classroom. Only pays attention when you yell at him.	None.	Mild dyskinesia with bilateral choreo-athetosis stuttele.	I.Q. One hundred on Terman Merrill. Average on Progressive Matrices.	Generalized high amplitude activity over both hemispheres.
12	F	5	14	18	Normal.	Spontaneous vertex delivery at term. Born in intact membranes, and cord around neck. Severe apnoea. B.W.—6 lb.	Never still since the age of one year. Investigates everything and throws things about for no reason. Sucks everything she can, and masturbates. Temper tantrums.	None.	Mild right hemiplegia with homonymous quadrantic field defect and aphasia.	I.Q. Ninety-two on Terman Merrill Scale.	Not done.
13	F	5½	18	42	Normal.	Mother had antenatal haemorrhage at 37 weeks of pregnancy. Child born spontaneously by the vertex. Two true knots in the cord. Five minutes apnoea. B.W.—7 lb. 8 oz.	From age 1½ years she chewed everything in sight, and when she began to move about her fingers were into everything.	A typical grand mal 2-3 times daily with aura of confusion and disorientation for about 1 minute. No clonic movements, but marked tonic phase with loss of consciousness for up to 3 minutes.	Clumsy, but no abnormal neurological findings.	Unstable but severely defective.	Grossly abnormal. Large delta waves with spikes from all regions, but most evident from right temporoparietal region.

ACQUIRED CASES

14	F	4	12	12	Normal.	Cortical venous thrombophlebitis at 15 months following chronic otitis media.	Aged 2½. "She began to bite me, her bedclothes and anything else in sight." Always on the go.	Grand mal every 6 to 10 weeks. Psychomotor attacks every day.	Right homonymous hemianopia. Aphasia.	Unstable, but grossly retarded.	Generalized wave and spike forms.
15	M	8	12	13	Normal.	Very severe whooping cough with "encephalitis" aged 2½. Threw everything she didn't like away, and chewed everything she did.	Aged 3½ became self-willed, determined and uncontrollable. Threw everything she didn't like away, and chewed everything she did.	Jacksonian epilepsy on left side with loss of consciousness two or three times a week.	Left hemiplegia. Left visual field defect.	I.Q. about 70 on Terman Merrill.	Generalized delta activity most marked over right hemisphere.
16	M	6	15	15	Normal.	Cortical venous thrombophlebitis complicating chronic otitis media aged 23 months.	Began to chew bedclothes and be on the go all the time—aged 3. Seems to understand simple commands, but quite unable to pay attention to them for more than a few seconds.	Jacksonian attacks involving right side only with loss of consciousness every day or second day.	Right hemiplegia. Loss of speech. Palpable internal jugular thrombosis.	Grossly retarded. Idiot.	Not done.
17	M	11	48 (approx. date)	132	Normal.	Cerebral thrombophlebitis and left temporal lobe abscess complicating left mastoiditis aged 6 weeks.	From age 18 months became busier and busier with himself, and now never stops to notice what happens outside him.	Jacksonian attacks involving right side only with impairment of consciousness	Severe right hemiplegia. Right visual field defect.	Unstable. Idiot.	Generalized delta activity. No localizing features.
18	M	7	13	14	Normal.	Tuberculous meningitis aged 14 months. Relapse aged 22 months.	As soon as he could walk again he ran, and when he was too tired to do anything else he sucked things. Life is one long battle between him and everything else.	None.	Right hemiplegia. Cerebellar ataxia. Defective vision.	Unstable, but probably high grade defective.	Generalized high amplitude activity most marked over left hemisphere.
19	M	9	12	12	Mother psychopathic. Father unknown.	Very severe whooping cough age 5, with convulsions. Forty-two paroxysms a day at one stage, during many of which he was unconscious.	Three months after whooping cough he ran home from hospital, and has been running ever since. His fingers are into everything.	None.	Equivoal right plantar. Cerebellar ataxia. Visual defect. Probably myopia only.	Difficult to test, but probably high grade defective.	Not done.
20	M	9	13	13	Normal.	Run over by lorry aged 8. Severe head injury. Unconscious one week. Left temporal lobe contusions.	Before accident was often naughty, but he knew when he had been. Now it is different; he does not do it for spite; it is as if a devil gets him.	None.	Right hemiplegia. Aphasia. Right homonymous hemianopia.	Average intelligence on test.	Not done.
21	F	5	42	36	Two of 5 maternal siblings mentally defective.	Pneumonia with very marked persistent cyanosis aged 14 weeks, with convulsions for 24 hours.	From 1 year old (or less) failed to pay attention to anyone talking to her. Chewing of clothes and sheets.	Has been found semiconscious at night on three occasions.	Bilateral hemiplegia. Congenital heart defect.	Unstable. Idiot.	Not done.
22	F	5	15	11	Sister has functional behaviour disturbance.	Severe attack of gastro-enteritis age 15 months, with tonsillitis and cerebral thrombophlebitis.	Since age of 2 progressively active and difficult to manage. Makes no contact with anybody.	Only with infections. Generalized convulsions.	Slightly increased tone right side. Aphasia, and retardation of speech development.	Unstable. Probably high grade defective.	High amplitude theta activity from anterior part of cerebrum. Burst of waves and spikes.
23	M	12	14	26	Normal.	Left facial swelling, and drowsiness aged 10 months. ? "encephalitis" with generalized convulsions and loss of consciousness.	Progressively more active from the age of one year. Oblivious of danger. Unable to concentrate or learn at school.	None.	Mild left hemiplegia.	Scores on WISC performance—89. WISC verbal—82.	Only minor abnormalities. These consisted of low amplitude, slow activity widespread over the surface of the skull.
24	M	5	15	20	Father cerebral tumour. Mother anxiety neurosis.	Cerebral thrombophlebitis aged 2 years, following bilateral otitis media.	Disobedient, unpredictable and destructive from age of 4 years.	Grand mal epilepsy every 4-6 weeks.	Moderately severe left hemiplegia.	I.Q. Seventy-five on Terman Merrill.	Generalized high voltage activity but no definite focus.
25	F	4	12	13	Normal.	Cerebral thrombophlebitis aged 13 months complicating middle ear disease.	Increasingly overactive and restless on age 18 months. Cannot sit still or resist playing with anything or anybody she sees.	Attacks of falling and momentary loss of consciousness 2 to 3 times a day. Petit mal 6-8 times a day in spite of anti-epileptic drugs.	Moderately severe left hemiplegia with probable left homonymous visual field defect.	I.Q. about 50 on Terman Merrill and Wechsler Scales.	Widespread slow waves of different frequencies rather more marked on right.

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to a general medical and detailed neurological examination. Whenever the child was felt to be co-operative enough for helpful results to be obtainable, intelligence testing and electroencephalography were attempted. A number of patients had been more fully investigated by air encephalography and arteriography in other hospitals, and the results of these investigations were obtained.

OBSERVATIONS

Of the twenty-five patients, sixteen were male, and nine were female. Their ages varied from four to twelve years at the time of examination. The majority had first been referred to paediatricians for examination shortly after beginning school, or on reaching school age. In all the cases there was evidence in the histories, or on examination, which suggested the presence of cerebral damage. In thirteen cases this appeared to have been sustained at the time of birth ("Congenital cases"), and in twelve it had probably occurred as a result of intracranial infection, vascular disorder or haemorrhage after delivery ("Acquired cases"). The histories and results of examination are summarized in the accompanying table. As far as possible the description of behaviour symptoms is recorded in the parent's or guardian's own words.

BEHAVIOUR

In the congenital cases overactivity was not usually complained of until the children were between twelve and twenty months of age. Six patients were noted to be rather drowsy or lethargic in the first six or nine months of life, and seven were thought to have shown normal behaviour. Only gradually did symptoms of abnormal behaviour appear, after this time. In the acquired cases there was also a latent period following the initial intracranial infection or accident before overactivity was apparent. In eight there was a period of between six weeks and four months of apparent lethargy and in four a similar period of normal behaviour prior to overactivity becoming apparent.

Following the period of normal behaviour or lethargy the children became more and more active, and the parents complained that they were always restless and never tired by play. They began to take an unusually intense and sustained interest in features of their immediate environment. This interest was usually shown as a marked tendency to crawl or run rapidly to every object within reach, handle it and whenever possible bring it to the mouth to suck, lick or chew. Having explored it the object would be thrown away, only to be replaced immediately by another. Activity of this type could persist for many hours at a time, day after day, without the child tiring or seeming to become familiar with the objects he had handled. A single empty box, for example, might be explored with great urgency some twenty or thirty times a day for weeks on end, until its paint was licked off, or it was chewed beyond recognition. Failure to benefit by experience was shown by the frequency with which jets of steam or fires had been handled repeatedly in spite of burns being caused. No object or person could hold the child's interest for more than a matter of seconds, and the distractibility was such that even meals were interrupted repeatedly because of the child's compulsive desire to handle and suck things he had already investigated many times that day.

The marked desire to suck, bite or chew presented a major problem in some of the more severely affected patients. Some mothers had found that the amount of destruction caused to clothes and bedding was lessened if the child

was provided with a piece of cloth (Cases 6, 14, 16) or string (Cases 9, 16, 21) or a handkerchief to chew. But in two cases it proved impossible to keep the children in clothes at all. One had to be put to bed naked between bags made of rubber, and another naked on the springs of a spring mattress without bed-clothes, but with an electric radiator placed high on the wall out of reach to keep him warm.

Scolding or beating were effective in modifying behaviour for only a minute or two, if at all. Even the children who knew what was considered right or wrong failed to resist the impulse to touch, put to the mouth and tear whatever had attracted their attention. When frustrated they were liable to rages, and often showed much strength and ferocity in aggressive behaviour of great intensity. Similar outbursts were a feature of the behaviour of most patients from time to time without there being any apparent provocation for it. In these aggressive phases the child would appear to be attacking his surroundings at random, kicking, hitting and biting everything in sight, whether animate or inanimate, animal or human. The majority of the patients had been refused permission to play with neighbouring contemporaries by the time they were two or three years of age.

The patients appeared to show a lack of affection for their parents and siblings. Five mothers complained in almost identical terms that they were "treated like pieces of furniture", to be touched and sucked or bitten whenever the child felt the urge to do so. Younger brothers and sisters were often brutally handled by the patients without apparent provocation. Six of the patients were said to have sudden "outbursts of love" when they would rush to one or other parent, sometimes practically throwing themselves at them and demand to be fondled and treated like infants.

Fear was absent in most of the patients. Two children, neither of whom could swim, had been rescued from drowning, one on two occasions. Attacks on adults who were total strangers and on older children were frequent. Characteristically the patients were those who could be dared to feats of courage with the greatest ease, and mothers complained repeatedly of the frequency with which their clothes were torn, and cuts and bruises needing medical attention were sustained.

By the time they went to school overactivity was a major problem in the patients. Teachers found that their restlessness, inability to concentrate, and their marked distractibility together with aggressive outbursts made education quite impossible in many cases, not only for the patients but for the rest of the class as well. The majority of children had been in at least two schools by the time they were seven, and periods of exclusion from school were often noted.

Marked fluctuations of mood and of the degree of overactivity were present in the majority of cases. These fluctuations were present from day to day and from week to week. It was found that the periods of intense overactivity tended to diminish in frequency, duration and severity in most cases after the age of seven or eight years. Two patients who had previously been considered to be ineducable on account of their overactivity so improved in behaviour without specific treatment by the age of twelve that full-time schooling was possible (Cases 11 and 23).

In most cases sleep was very deep and it was found very difficult to rouse the children from it. Its duration was usually between six and eight hours, and parents frequently asked if this could be considered enough in view of the amount of energy their children seemed to use in the day.

EPILEPSY

Epileptic attacks of various types were present in thirteen of the twenty-five patients and were absent in twelve. Five had grand mal convulsions without any apparent localizing features (Cases 5, 9, 14, 21, 22 and 25). In Case 21 the onset of an attack had never been witnessed, and in Case 22 convulsions were infrequent and only occurred when the child was febrile. In Case 25 the patient also suffered from petit mal. Her attacks of grand mal were atypical but showed no definite localizing features. Case 14 suffered from both grand mal and psychomotor attacks. The latter occurred three or four times a day. During them the child seemed to be quite disoriented and would run about waving her arms for from one to three minutes alternately crying and laughing. She usually passed urine during attacks, and slept or was drowsy after them. In two patients with grand mal (Cases 4 and 13) each fit was preceded by a period of one or two minutes in which the child was disoriented and hallucinated. Both cried out in fear during this time. Case 4 persistently complained of bears, ghosts or burglars coming to attack him from the right hand side, and would curl up in his bed in great terror immediately before losing consciousness and showing clonic movements of the limbs. In Case 24 the epileptic attacks, which were very typically of grand mal type were constantly preceded by sniffing and chewing movements for about twenty seconds.

In three of the acquired cases (15, 16 and 17) the attacks were frankly Jacksonian in type. In the latter case consciousness was impaired but not lost, whilst in the other two consciousness was lost for five or ten minutes. In Cases 15 and 17 the patients had warning of attacks and would run to their mothers, apparently very afraid, which was very unusual behaviour for them. In Case 15 the child became hallucinated for a few seconds before each attack and would cry out in terror, "They are coming to get me", or some similar phrase. Owing to the severe mental defect in Case 17 it is difficult to be sure that the child was in fact hallucinated, but the mother was convinced that "He seems to see things" immediately before his attacks. In Cases 15 and 17 clonic movements began in the face, in Case 16 in the paretic right hand. In Case 3 the attacks were confined to the right side, but were not typically Jacksonian in type.

The frequency of grand mal or Jacksonian attacks varied greatly from patient to patient from an average of one a year in Case 21 to three or four a day in Case 13. The occurrence of convulsions appeared to have no great effect on behaviour afterwards except in Cases 9, 14 and 22, whose mothers all thought that behaviour was less overactive for a day or two after each attack.

NEUROLOGICAL FINDINGS

The neurological findings are summarized in the table. It will be noted that in two patients no definite neurological abnormalities were found (Cases 6 and 13) though the histories were compatible with the occurrence of cerebral birth injury in each case, and in the latter the electroencephalogram was grossly abnormal. Seventeen cases showed hemiplegia, ten on the right and seven on the left. Case 21 showed bilateral hemiplegia. Spastic diplegia was present in two patients (Cases 9 and 10), both of whom had ataxia of cerebellar type. Case 11 had moderately severe bilateral choreo-athetosis, apparently of congenital origin. In Case 19 there was ataxia of cerebellar type associated with defective vision, slight increase of the tone in the right limbs and an equivocal right plantar response, the left plantar response being flexor. In Case 22 there was slight increase of tone in the right side associated with aphasia, but the plantar

responses were flexor bilaterally. Neither of these children had significant paresis of the limbs.

INTELLIGENCE TESTING

Intelligence testing was attempted in the majority of cases, but to obtain reliable estimates of intellectual endowment was extremely difficult on account of their poor co-operation and concentration. Of the nineteen children in whom formal testing was attempted ten were considered to be of at least average intelligence. Seven were "dull and backward" or high grade defectives, and two were severely defective. Six were untestable or probably severely mentally defective. School performance appeared to bear little relationship to the level of intelligence estimated as a result of testing. This seemed to be because the children could be induced to concentrate a little better for the relatively short time of the test than they could be in a busy classroom.

ELECTROENCEPHALOGRAPHY

Nineteen patients were subjected to electroencephalography, but the recordings were unsatisfactory in three owing to their marked restlessness. In the other sixteen cases the records were within normal limits in two (Cases 6 and 10). In nine cases the recordings were outwith normal limits, but the abnormalities were present bilaterally. In Cases 4, 6 and 13 generalized delta activity of moderate amplitude was present bilaterally, but was most marked over the left temporal region in Case 4, and over the right parietal region in Case 6. In Case 13 the maximum activity was in the right temporoparietal region. In Case 18 there was generalized high amplitude activity most marked on the left.

TREATMENT

Phenobarbitone had been given to fourteen patients in the series, eleven of whom had epileptic attacks. Of the latter eight showed a reduction of the number, or abolition of the epileptic attacks following administration of the drug, and in three there was little or no difference in the number of attacks or in their severity. Of the fourteen patients who had been given phenobarbitone two showed diminished overactivity following its administration (Cases 19 and 21). In four patients no significant change in behaviour was noted. In eight patients there was a definite exacerbation of the overactivity, especially of the tendency to aggressive outbursts. In two (Cases 4 and 13) this exacerbation had been treated by increasing the dosage of phenobarbitone, and an apparently still more marked behaviour disturbance had resulted. A dosage as small as gr. $\frac{1}{4}$ twice a day in two five years old children (Cases 13 and 22) was sufficient to increase the severity of overactive behaviour.

Phenytoin sodium had been given to seven patients, all of whom suffered from epilepsy. In four the attacks were abolished or reduced in number, and in three they were unaffected by the drug. Behaviour was unaffected in four patients, possibly slightly improved in two, and exacerbated in one.

Amphetamine sulphate had been given to nine patients, four of whom had grand mal or Jacksonian epilepsy. In a dosage of from 10 to 30 milligrams in the day it resulted in a diminution of the number of epileptic attacks in two cases (13 and 15). In the former the frequency of psychomotor attacks was also reduced. In two patients epileptic attacks were unaffected (Cases 4 and 24). The overactivity was unaffected in four patients, slightly diminished in one, and greatly lessened in four. In all four in whom there was marked improvement

distractibility lessened and there was a gain in the ability to concentrate. Thus school work improved dramatically in two cases (8 and 11).

Primidone had been given to ten patients, of whom five suffered from epilepsy. In four the attacks were abolished or much lessened in frequency. In one (Case 3) there has not been time to assess its effect on the infrequent convulsions. In seven patients there has been a dramatic lessening of the overactivity, a marked improvement in the span of concentration and a reduction in the severity and frequency of aggressive outbursts. The improvement has been evident within two or three days of giving the drug in a dosage of 125 milligrams twice a day in all the seven cases, and has been maintained on this dosage for periods of up to nine months. In one of the three patients who failed to respond to primidone (Case 8) the overactivity was somewhat diminished by treatment with reserpine (Serpasil), 0.25 mg. three times a day, but a more satisfactory response was obtained with chlorpromazine, 25 mg. three times a day.

The home management of the patients was a matter of great difficulty because of their intense distractibility and tendency to have aggressive outbursts whenever they were frustrated. In general, parents who were able to adopt a rather firm but kindly attitude, and whose discipline was strict, appeared to be more successful in producing relatively amenable behaviour than did those who regarded the disorder as being beyond the child's control. Though psychotherapy increased insight into the nature of their disability in a number of the more intelligent patients it did not by itself appear to result in significant improvement in behaviour.

AETIOLOGY

Cases were grouped into congenital and acquired categories on the basis of their birth history, their milestones and the presence or absence of evidence suggesting that there had been a change in behaviour following a later episode of intracranial trauma, infection or cerebral anoxia.

Detailed medical notes of the births were available in nine of the thirteen congenital cases. In Case 10, who was adopted at the age of three weeks, no details of the birth could be obtained but she was said to have "had a very rough time of it during delivery", and at the time of adoption was unusually drowsy and difficult to feed. In Cases 7, 8 and 9 full medical details of the births were not available, but in all three delivery was known to have been abnormal.

Prolonged apnoea after birth was present in eight cases and in none of these had labour and delivery been normal. In Case 4 the child breathed immediately after birth, but the history of severe coal gas poisoning of the mother twenty-six hours before the birth, after which foetal heart sounds could not be heard and foetal movements were absent was felt to suggest the presence of foetal anoxia. It is impossible in retrospect to attempt to assess the degree of trauma and anoxia to which each infant was exposed.

Full details were obtained of the illnesses and accidents which appeared to have resulted in changes in behaviour and neurological abnormalities in all twelve of the patients in the acquired group. All but one (Case 21) had been admitted to hospital on account of the causative conditions. With the exception of Case 20 who was knocked down at the age of eight years, and Case 19 who suffered from very severe whooping cough at the age of five years, all the acquired cases were under the age of three at this time, and eight were under the age of two years.

In six cases the causative disorder was diagnosed as cortical thrombophlebitis. In five patients this was a complication of acute or chronic middle ear

disease (Cases 14, 16, 17, 24 and 25). In Case 17 an extensive cerebral abscess resulted, which destroyed much of the left temporal and parietal lobes. In Case 16 thrombosis of the internal and external jugular veins occurred and air encephalography revealed gross left cerebral atrophy. In Case 14 air encephalography revealed marked bilateral enlargement of the lateral ventricles and cerebral atrophy which was more marked on the left than the right. In Case 22 very severe dehydration resulted from gastro-enteritis which complicated an attack of tonsillitis. Recurrent convulsions with impairment of consciousness were present, and following investigation cerebral thrombophlebitis was diagnosed. In two cases (23 and 21) there were histories suggestive of the occurrence of cerebral thrombophlebitis, but this diagnosis was not made at the time of the illness, and it is impossible to be certain about it retrospectively.

In Cases 15 and 19 changes in behaviour occurred following severe attacks of whooping cough, complicated by fits and impairment of consciousness in both. In Case 18 the patient developed tuberculous meningitis at the age of 14 months. This was successfully treated with streptomycin, but a relapse occurred eight months after the initial attack, and following recovery she became progressively overactive. Case 20 was unconscious for one week following head injury. Severe widespread cerebral contusions most marked over the left temporal lobe were noted at exploratory operation following the accident.

DISCUSSION

Overactive behaviour of the type shown by the patients in the present series has been described by a number of authors (Bakwin and Bakwin, 1953; Peterman, 1953). The most detailed account is that of Ounsted (1955). This author found 70 patients who exhibited this form of behaviour amongst over 800 children referred on account of epileptic attacks. The behaviour was characterized by increased distractibility, a short attention span, fluctuating mood with underlying euphoria, aggressive outbursts, diminution or absence of spontaneously affectionate behaviour, lack of shyness and absence of fear. The children were apparently tireless and failed to respond to reprimand or punishment. Their intelligence varied from high average to grossly defective. The majority of patients showed no definite neurological lesion, but fifteen of them showed spastic hemiplegia. A wide range of normal and abnormal electroencephalographic patterns were noted. Phenobarbitone tended to exacerbate the behaviour disorder in most patients but resulted in a reduction in the number and severity of epileptic attacks. Amphetamine was effective in improving the behaviour symptoms in a proportion of cases, and caused a reduction in the frequency and severity of fits. Primidone was the most frequently successful drug in controlling both the fits and the behaviour symptoms.

Ounsted did not comment, however, on the very marked oral tendencies exhibited by the majority of patients with this form of overactive behaviour. A tendency to touch everything in sight and then suck, bite or chew it in order to investigate it further was one of the most striking and consistent features of the patients in this series. It is also worth stressing that epilepsy is by no means a constant finding in patients with overactive behaviour of this type, though in the majority of cases the histories and findings on examination indicate that brain damage has occurred. In the present series as many as twelve of the twenty-five cases had no convulsions. The tendency for there to be spontaneous remission of the overactivity in a proportion of cases is also noteworthy.

A number of authors have postulated that the form of overactivity which

has been described is most frequently the result of subcortical brain damage and that it often follows anoxia at the time of birth (Balf, 1952; Ounsted, 1955). However the frequency with which Jacksonian or unilateral convulsions, hemiplegia, aphasia and homonymous visual field defects occur in the present series suggests strongly that cortical lesions are usually present, and that they involve the temporal lobes in at least a proportion of cases. The visual and gustatory auras which were present in at least four of the cases with epilepsy provide some supporting evidence in favour of this conclusion.

The finding that only two of the patients showed electroencephalographic foci in the region of the temporal lobes is not against this hypothesis, for it has been stressed recently that unilateral temporal lobe lesions, especially those involving the hippocampus, may give rise to widespread bilateral dysrhythmia over the surface of the brain (Gastaut, Naquet and Roger, 1952).

The high proportion of congenital cases with a history of neonatal apnoea or other paranatal anoxia is of interest. It has been shown that anoxia at the time of birth or later is not infrequently followed by the appearance of localized areas of cortical necrosis and scars, as well as the more commonly occurring striatal damage (Courville, 1953; Penfield and Erickson, 1941). The particular liability of children, especially those under the age of three years to suffer from cortical thrombophlebitis as a result of acute or chronic otitis media and other infections in the region of the head and neck has long been known. The occurrence of cerebral abscess, particularly in the region of the temporal lobe is a well-recognized complication (Symonds, 1927; Ford, 1952).

There is some interesting experimental evidence that induced lesions of the temporal lobes in animals may result in overactive behaviour, similar in some respects to that observed in the patients in the present series. Following bilateral temporal lobotomy involving the uncus or hippocampal gyrus in monkeys it was found that the animals became markedly overactive (Klüver and Bucy, 1939). These authors found that the animals showed "psychic blindness" manifest as a tendency to approach animate and inanimate objects without hesitation, even when previously they had been afraid of them. There was an apparently compulsive desire to contact every object in sight, handle it and put it to the mouth. Oral tendencies were very marked and every object which could be reached was sucked or chewed and swallowed if edible. The authors noted the presence of "hypermetamorphosis" or evidence which suggested that behaviour was being controlled by an irresistible impulse or series of impulses. Emotional changes sometimes occurred, usually tending towards a lessening of affection for the opposite sex.

In the cat alterations of behaviour were observed after damaging the hippocampal gyrus experimentally by Gastaut, Vigouroux and Naquet (1952). These authors found that the animals showed chewing movements and overactivity of the muscles of the mouth associated with excessive salivation. There was a tendency for the cats to be unusually alert and active in exploring their environment, especially on the side opposite to that on which the lesions were made. Sometimes unusual states of rage and fear were noted.

To lay too much stress on the results of these animal experiments, especially when they involve observations on behaviour is obviously dangerous. There does, however, appear to be a remarkable similarity in some of the features described as being typical of the behaviour of the animals after experimentally induced lesions of the temporal lobes, especially those involving the hippocampus to that found in the patients described, the majority of whom showed other evidence of cortical damage.

SUMMARY AND CONCLUSIONS

The histories and clinical findings of twenty-five children showing a characteristic type of overactive behaviour are described. The behaviour is typified by an increase in distractibility, poor attention span, an apparently irresistible urge to touch and chew every object which is seen, a diminished capacity for spontaneous affectionate behaviour, aggressive outbursts, an absence of fear and a failure to respond to reprimand or chastisement. Neurological findings indicating the presence of cortical lesions were present in the majority of cases and thirteen, or about half, suffered from epilepsy. In most patients phenobarbitone resulted in an exacerbation of behaviour symptoms, though the drug appeared to diminish the epileptic manifestations. Amphetamine and primidone were successful in controlling both behaviour symptoms and epileptic manifestations in a high proportion of the patients to whom they were given.

Most of the patients had histories suggesting the occurrence of cerebral injury. In thirteen this appeared to have been sustained at the time of birth, most commonly as a result of perinatal anoxia. In twelve cases it was acquired as a result of trauma or anoxia or of intracranial infections of which cerebral thrombophlebitis was the most common. All but two of the twelve acquired cases were under the age of three years at the time of their causative illness.

The histories and neurological findings, especially the frequency with which aphasia or disproportionately severe retardation of speech development, homonymous visual field defects and Jacksonian or epileptic attacks with visual or gustatory auras occurred suggest that the majority of the patients suffered from lesions of the cerebral cortex involving the temporal lobes in a proportion of the patients. Abnormalities of behaviour showing a resemblance to the symptoms present in the patients in the series have been produced experimentally in animals by temporal lobotomy.

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ASTHMA: A SYNTHESIS INVOLVING PRIMITIVE SPEECH, ORGANISM AND INSECURITY

By

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HISTORICAL BACKGROUND

ASTHMA is an illness which has puzzled our profession since earliest times. Each generation has based its concept of aetiology on current concepts of disease, so that delving into its history shows a colourful pattern of widely conflicting views.

Early in this century Osler (1910) is in favour of a nervous cause, though he pays little attention to treatment on psychological lines. After that date there is a procession of changing viewpoints.

In the second decade, anaphylactics, according to Conner (1917), have cracked the hard core of the aetiological riddle, but Eppinger and Hess (1917), writing of vagotonia, correlate this with the asthmatic attack.

Freeman (1921) writes of precipitating nervous reflexes. Bray (1934) is convinced that the allergist holds the key to solution. There is emphasis on allergic diathesis and an hereditary asthmatic constitution.

Wittkower (1935) showed that asthma might have a purely psychological conditioning. Since that time, belief in the importance of the psychological factor is still gaining ground.

The theme of the present communication arose from research of Bostock and Shackleton (1951, 1952) on the aetiology of enuresis. There emerged the concept of premature toilet training interfering with later development of urinary control. It suggested that a study of asthma in its early stages might show an interference in the normal process of respiratory and speech maturation.

As will be shown, there is a similarity, although the mechanism is more complicated.

PHASE 1 OF THE ASTHMA SYNTHESIS

The Maturation Factor

Case Material. The cases on which this survey is based were initially obtained through the guidance clinic of the Brisbane Children's Hospital. In order to increase numbers, access was obtained to asthmatics attending the allergy clinic.

Diagnosis was based on the existence of recurrent respiratory spasms labelled by the physician as asthmatic. The final score consisted of 60 cases, but 22 were rejected on the ground of evidence insufficient to warrant conclusions. Either the patients failed to present themselves after a first interview, or the history was inadequate.

At the outset, a comprehensive schedule was outlined. Questionnaire and fact-finding by observation embraced all aspects which it was considered might have a bearing on the asthmatic ensemble. They included major psychological traumata, records of previous illnesses, allergies and physical findings.

Among the many incidents of each individual history were enquiries as to marital relationships of parents, and desire to have children. There emerged the

finding that no fewer than 22 of 38 mothers admitted an unwelcome baby.

Closer correlation was reached in the enumeration of those children who had disturbances in breast feeding. Of 38 children, only 8 had been breast fed for an adequate period. Twenty-eight had no breast feeding. There were two cases in which the record was doubtful.

The connection between the two findings seemed sufficiently close to warrant investigation as to whether "Rejection or Desire" and "Bottle Feeding or Breast Feeding" could help us to unravel a complicated aetiology.

Rejecting Mothers

In research survey must be unbiassed. No correlations are therefore permissible until case taking is finalized.

Questions were asked tactfully but factually. None were overstressed. In the case of the 22 mothers, who not merely admitted that they did not want the child, but also gave reasons (see Chart 1), it may be inferred that their maternal unwillingness is factual, but it does not follow that the remainder who expressed a yearning for motherhood are non-rejecting mothers. A desire to conceal faults is common.

In 8 cases, although the mother did not admit rejection, the observer on circumstantial evidence scored "probable rejection". There were reasons for rejection such as an extremely nagging grandmother; a child not up to expectations; an adopted child which preceded her own child, and an unhappy separation from a husband on account of marital conflicts and maladjustments. The majority of the suspect rejectors did not feed the baby on the breast. Eight mothers emerged scatheless through the screen of rejection. Their case will now be considered.

CHART 1

The Reasons Given by Mothers for the Rejection of Their Children

	Cases
Unhappy marriage	2
Wrong sex	6
Similarity to hated spouse	2
Another sick child to mind	1
Reinforcement of previous rejection by subsequent miscarriage of child of desired sex	2
Deprived childhood by parent who resented children, cold parent	2
Reluctance to increase already existent family	1
Long and unsatisfactory illnesses of infants	4
Children bring too much work and responsibility	4
Too early pregnancy after marriage	2
Illegitimate birth	1
Pregnant with own child three months after adoption of patient	1
Adopted child of wrong sex	1
Housing conditions inadequate	1
Illness in house "exhausted" mother, so childbirth was not wanted	1
Children arrive too close	1

The reasons given by mother for bottle feeding were less numerous. Twenty stated they had "no milk". A few volunteered further reasons for the deficiency.

CHART 2

	Cases
"No milk"	20
Child in hospital for first six weeks and a subsequent difficult infancy	1
Intervention of second pregnancy	1
Adopted child	3
"Milk no good for the child"	2
Death of mother at child's birth	1
"Milk went" after few weeks	3

Non-Rejecting Mothers

At first sight the existence of a block of non-rejecting mothers would seem to contradict a thesis that rejection has a high aetiological significance. It must, however, be remembered that psychological end points can often be reached by different routes. A simple example is of maladjusted children produced by either harsh or over indulgent parents.

The dynamic forces created by a rejecting mother owe much to the child's feelings of insecurity. Similar results can be achieved by an entirely different approach.

Seven of the eight non-rejecting mothers with adequately breast fed children had reasons for regarding the child as more than usually precious.

A mother herself the product of a neurotic mother was obsessively determined that her children would be "brought up better" than she had been. One child had many hospitalizations and became the object of universal sympathy. Two mothers were asthmatic, and identified themselves with the children. Another mother had a miscarriage, another a death prior to birth of the baby who was over prized and tended with fear. The last mother welcomed baby as solace to fill a void; she had no love for her husband. Such children are deprived of a normal thrusting outlook. Instead of learning to swim with and against the tide of life, they are submerged by overpossessive parents. Caught within the net of over protection, their wishes are thwarted, and nature urges them to escape. They feel as insecure as criminals planning for a getaway. Watched incessantly, they feel bewildered.

Furthermore, rejection and submergence can blend. Many of our rejected children are by a paradox also submerged. The rejecting mother tries to make amends for her feelings by a compensating over interest. Abramson (1954), who uses the term "engulfment" instead of "submergence", has stressed the frequent co-existence of the two mechanisms.

Insecurity and Rejection

The *Oxford Dictionary* includes under the feeling of being secure, protection from danger, freedom from want, anxiety or apprehension.

Whilst all normal children are exposed to insecurities, there can be degrees which are pathological.

Objective proofs, as shown by projection tests in our laboratory, indicate this, and show that insecurity has a continued and strong influence. It must be regarded as prime mover in the complicated series of events outlined below.

<i>Rejection by Mother</i>	creates	<i>Insecurity in Child</i>
Begets guilt feelings		Begets frustration
Over compensation		Fear, irritability and
Over protection		hostility

Stemming from such basic mechanisms are secondary situations.

<i>Mother</i>	<i>Child</i>
Gives correction with or without punishment and still more correction with or without punishment.	Becomes aggressive. Correction and punishment engenders more aggression and still more aggression.

Correction and retaliation recur in a vicious circle.

If maternal inadequacy, submergence and over possessiveness be substituted for rejection, the sequelae are similar. All create patterns of hostility.

Neither mother nor child is static. Each personality influences the other in many ways. The final phases are dependent upon months and years of interaction in which each tries to be dominant. There is a mounting crescendo which can produce a temper tantrum, a hysterical outburst, a bout of bed wetting, an allergic manifestation or an asthmatic attack. The end result may be an irritable or despondent mother attending the doctor for treatment of "nerves", and a psychotic or outlaw child adolescent or adult needing attention in an institution.

It must be clearly understood that the mother's rejection and guilt lies in the unconscious. Guilt exists because reproduction is a basic urge, and its rejection is negation of a life force. The mothers ignorant of the process often exhibit patient and kindly self control in the face of difficulties.

However, in spite of skill in dealing with their problems, the conduct does not deceive the child who picks up double entendres, hidden sarcasms and slips of tongue. More importantly, it senses a lack of emotional warmth which is almost impossible to disguise.

Most rejecting mothers have every wish to be "good mothers", and make valiant attempts at perfection. Their misfortune is that they are out of step in a complicated series of interpersonal and biological relationships.

Insecurity and Submergence

Psychological pitfalls are numerous. They may lead to the highly intelligent child of great promise being doomed to crabby and derelict old age, or to a marriage destined to disaster. Among the influences to unhappiness must be cited the submerging mother who, in search of security, plans her child's life to the last perfectionist detail. By urging the child to pattern itself on "what should be" rather than "what is", she achieves the opposite. A frustrated infant with unresolved aggressive tendencies emerges instead of the peaceful, pliable offspring of her dreams.

Aggression pertains to an essential urge. It leads the child to maintain poise with the outer world, to overcome dangers and problems. It makes for action, self reliance and courage. Damming the stream of aggression creates a mounting pool of frustration. Eventually the bursting banks lead to unrestrained aggression and hatred for the tyrant—a mother who has thwarted desire.

Thus a paradox is achieved. The submerged child rejects its parent. Substantially the case of the rejecting mothers and the rejecting child are identical in that the end result is insecurity. The rejecting child is forced to conceal hatred, and must simulate an appearance of love. He fears loss of mother's affection and its material advantages. Guilt becomes his portion. He senses his duty to love, but powers beyond his control force him to hate. Security is impossible in such a tangle.

Insecurity and Bottle Feeding

Relationship of breast or bottle feeding to rejection will now be considered. The place of the breast in the ladder of life has been stressed by many.

Thus, Winnicott (1947-48) states that the breast is an important step in the child's growth to reality and emotional stability; it enables him to realize that mother ". . . continues to exist, lives, smells, breathes, her heart beats. She is THERE to be sensed in all possible ways. She loves in a physical way, provides contact, a body temperature, movement, and quiet according to the baby's needs. She provides opportunity for the baby to make the transition between the

quiet and the excited state, not suddenly coming at the child with a feed and demanding a response." Isbister (1954) sums up the position thus:

"There is increasing evidence that establishment of successful breast feeding is a step in the right direction in maintaining the mental health of both mother and child, and with the increasing realization of the importance of the stable family group it is receiving support from unexpected sources, from anthropologists to educationalists."

The ethnological importance of breast feeding is stressed by Margaret Mead (1935). She claims that the kindly stability of the Arapesh native is largely due to the warmth of the maternal breast feeding till the age of three, whereas the aggressive Mudgumor folk of the same racial stock are ridden with hostility based on early rejection by the parents.

Mowat (1954), who lived with the Eskimos in the Barrenlands of Canada, draws attention to their amiability. He ascribes it to the early training. "For three years after birth a child is suckled, and by the time it has been weaned it is already aware of the general pattern of its life."

Closer to Western practice, Mead (1953) cites the Greeks as among those whose sense of community integrity is highly developed. For them it is accepted as a right that the baby be breast fed. The traditional period of nursing is two years.

Such instances could be multiplied. They remind us that in the ladder of evolution breast feeding has played an important role. The sequelae of rejection suggest that it is not outmoded.

Dr. A. H. Humphry (1955), Deputy Director of Health, Northern Territory, in a personal communication, states that only breast fed babies of aborigines would survive: he could cite only one case of asthma in 7,000 records of natives. Such a finding is highly intriguing.

Psychosomatic Change

Psychological and psychosomatic manifestations can undoubtedly stem from maternal rejection. Profound changes have been reported by Bowlby (1940 and 1951) and Deutch (1939).

Abramson (1954) stresses the engulfment factor in many cases, and considers that often it is more serious than the accompanying rejection. He points out that a mother who commences as a child lover may become a child rejector, owing to the refusal of the baby to take the breast, or in other ways reciprocate an outpouring of affection.

Literature on evils due to rejection is hardly less dramatic than on bottle feeding. It seems clear that adequate maternal love and maternal breast or an adequate substitute are important to the baby's present and future well being.

One must now ask oneself how does rejection-bottle-feeding or submergence bottle or breast feeding play a part in the recurring drama of an asthmatic crisis.

The Evolving Pattern of Asthma

So far our data has referred to certain broad factors in the asthmatic background without revealing those responsible for the peculiar pattern of the asthmatic attack. There is evidence that emotional tensions are associated with its first appearance.

Two mothers of patients in our series had marked pre-occupation with a child suffering from a long debilitating illness. It continued after the birth of the subsequently asthmatic child.

In six cases asthma developed immediately after the mothers returned from hospital with another child.

In seven cases the first incidence of an asthmatic attack occurred soon after first hospitalization of the child, the most frequent reason being for tonsillectomy.

In four other cases there had been specific traumata prior to the first asthmatic attack, such as being left alone to cry under the house while the mother did the washing, or by being deprived temporarily of their mothers at a time of stress.

The above are indicative of an underlying insecurity, and are in keeping with the thesis of close relationship between rejection, submergence and asthma. They do not however indicate why an individual reverts to such a complicated mass pattern reaction involving upper and lower limbs, neck, chest and abdomen, rather than to a simpler spasm.

The author had the unusual experience of closely observing the actual onset of a first and second attack of asthma. The first occurred on a cold evening at nightfall whilst hauling baggage into a mountain shack. The second happened during the rescue of a water-logged boat during a storm.

Both cases highlighted the inhibition of an intense emotion. Darkness and danger impelled immediate and urgent action, but circumstances—fatigue, darkness and the elements—made progress at an inhibited speed.

The reader of romance will not need to be reminded that at the critical moment of emotion there is a catch in the heroine's breathing.

It may be said that if eyes are the window of the mind, vocal chords and respiratory system are tell-tales of the emotions. There is laughter of pleasure and deep indrawing of breath in grief. The reader who studies his own respiration will note a tendency for change in rhythm, even a stoppage, when an emotional problem creates doubt.

The asthmatic attack may fit into the same category. Wittkower and O'Neill (1953) consider that it is precipitated when the "*Respiratory system is subject to contradictory and inco-ordinated stimuli such as might result from abrupt inhibition of strong emotion*".

Viewed against this background, the crying of babies is important, since for them respiratory spasm and inhibited emotion are linked in an intimate manner. For the rejected the bond is even closer.

Many observers have pointed out the conflicts which beset the asthmatic child. He has an over protective mother who suppresses any expression of hostility. She makes him dependent by over protection, and thereby stifles aggression though the urge to rebel is still present. Instinctively he calls to his mother for help, but owing to his wish not to give in to his dependency he stifles the cry. There is thus a situation of breath holding with features of the asthmatic attack.

Alexander (1952) makes the significant remark that "the nuclear psychodynamic factor is a conflict centering in an excessive unresolved dependence upon the mother. As a defence against this infantile fixation, all kinds of personality traits may develop. Accordingly, we find among persons suffering from asthma many types of personalities—aggressive, ambitious, argumentative persons, daredevils, and also hypersensitive, aesthetic types." He points out that the purpose of crying is to regain the love of the mother, and that its suppression leads to difficulties in respiration.

The reversion to infantile behaviour under stress is commonplace—a man will kick his punctured motor tyre, roar with rage, smash the crockery. Such actions are even more complicated than an equivalent of crying.

Can a momentary cessation of breathing as occurs in an incident of stress trigger an infantile reaction—a mass pattern of active and complicated motion for which the infantile cry is the prototype?

The Template for Asthma

Oversimplification is dangerous. It is simple to say that rejection or submergence by a parent produces asthma through a feeling of insecurity in the child, but this does not explain the involvement of respiratory muscles instead of intestines or bladder. There must be a reason why insecurity is associated with a particular pattern response which is reactivated, reinforced or transformed into an asthmatic crisis.

The first clue lies in knowledge of evolutionary mechanisms. In the growing child there is an increasing complexity of actions and reactions, each based on a predecessor. A simple example is that skills gained in play form the basis or template for complicated skills in adult life. It is pertinent to ask if an antecedent activity presenting similarities to the asthmatic attack can be linked with feelings of insecurity.

As early as 1922 Weiss compared an attack of asthma to that of a screaming child, red in the face at birth. Fenichel (1954) regarded it as the cry of longing for its mother. Moses (1954) claims that just as allergy could be body speech and a rash can express protest, so breath holding can be equally expressive; stridor can glide into pseudo croup or later into asthma.

It will be noted that two intriguing and related ideas are emerging—crying is speech: asthma is based on crying. Both must be carefully examined since they suggest the existence of the template for an asthmatic attack.

Crying is Primitive Speech

In recent years naturalists have made important contributions to our knowledge of primitive speech. They have shown that many animals have a surprisingly large vocabulary, and that much meaning is produced by simple inflexion. Furthermore, the production and interpretation of sounds can occur immediately after birth, so is instinctive.

The strident cries of the jackdaw may be merely a discordant cacophony to listeners, yet Lorenz (1954) discovered that variations of the instinctive call cry had several different meanings to other jackdaws. They serve to transmit moods.

Howard (1953) has described a similar communication system among blue tits.

Corbett (1947) in his extraordinary feats of hunting man-eating tigers on foot was largely dependent upon beasts and birds telling him by cry language the location of his fear-provoking quarry.

Yerkes (1925), dealing with apes, quotes the observations of Boutan (1913) concerning gibbons. He considered they have a pseudo-language which enables them to express satisfaction, fear, intermediate states and excitement. In all there are 14 formulations.

Weston Le Barre (1954) in a recent book on the evolution of man reviews evidence concerning speech in the higher apes, and calls it "Phatic" communication; this spreads information concerning an individual's state of mind or emotion to the herd. The child's cry undoubtedly falls in the phatic category.

With such a background of primitive speech in lower and higher animals, surprise would arise if it had been lost by man during his evolution. In searching for it, a conventional view that speech commences with the articulation of such

words as "dad" and "ma" or the use of short sentences must be discarded. Such feats are equivalent to children running races in school sports. We wish to know the "crawl" speech which precedes the masterpiece of imitation adult speech.

Babies have urgent need to express feelings and desires. If they are to survive they must be secure. The instinctive goal is a warm, but not too warm, nest or crib, meals regular and to taste, clothes dry and easy fitting, skin unblemished, freedom from risks of falling, drowning or painful stimulus. Lastly they crave for the feeling of being mothered, since it is a constant reminder that all is well and the nest is safe.

With such a background it is not difficult to visualize the necessity for a cry language voiced in tones sufficiently loud to reach mother at a distance, and sufficiently impelling to create an instant response.

Stimuli setting in motion the machinery of primitive speech are varied. They include hunger, injury, over feeding, colic, tight binder, wet nappies, strange noises, over heating and similar situations needing attention. A sure method of evoking a bout of crying is careless bathing and clumsy holding.

Before the end of the first month an observant mother is able to tell by the cry language if the baby is hungry, in discomfort or just bored. The findings have been verified by questioning nursing mothers. They are emphatic on its reality, though find difficulty in describing the nuances of sound. In the second and third months there is the discovery by baby that the cry will produce mother, and that people can be influenced. Crying becomes an increasingly purposeful activity.

Summarizing the evidence, it would seem that crying in infancy has the status of primitive speech which is devoted principally to the registration of insecurity and the need for parental help and affection.

Other Features. Frightened monkeys on a bough do not rely entirely on their cry, but make appearance fearsome whilst at the same time tensing muscles for flight or fight. A cry is but one incident in a total response to insecurity. Babies, though more helpless, show a similar front to danger; activity is widespread.

Darwin (1889) drew attention to closing of the eyes, widely opened mouth and exposure of gums. Back and limbs are in spasm. Neck muscles, chest and abdomen take part in the general involvement. Respirations are altered, quick deep inspirations alternate with prolonged expirations.

A final feature of importance must be noted. As a rule the crying of infants is not accompanied by tears until the third month.

Darwin brushed one of his children's eyes and noted the screams. There were no tears in the untouched eye. His earliest record showed tears at 42nd day; the last was at the 139th day.

The findings have been checked in this study by observation and discussions with experienced nurses. Their significance appears as the details of the asthma attack are unfolded.

Subvocal Crying

The existence of a state of "crying without crying" or subvocal crying is probable. It would be misleading to consider that the audible and visible pattern of crying portrays the whole scene. Sounds and movements are indications of a deeper pattern of activity in the higher nervous system. Walter (1953) by the use of a toposcope shows that we must regard behaviour as having its origin in the flashes of activity which traverse the whole brain.

It is significant that through the encephalograph one can see many an

epileptic brain pattern which did not create "fits", though the record of "fit" preparation is indicated. In the same way there may be many, possibly a myriad "crying" patterns in the brain which do not result in "crying".

In a personal communication, W. Grey Walter (1955) admits hearing of many children with asthmatic and crying attacks who have EEG's outside the normal range, but is careful to stress the need for controls. The findings in this series likewise show many immature patterns. Such observations suggest a fruitful field for more intensive research.

For those who find difficulty in conceiving a state of inner tears, there is an easy exercise. On the next occasion when pity brings a droplet to the eye, before and after—often long after—there will be observed inner realization of a crying state. Furthermore, one realizes that one does not "feel oneself", thus demonstrating repercussions on the whole personality. Whilst this is not visible to an observer, it reveals patterns of crying in the cerebral cortex and deeper structure of the new and old brain.

If we visualize an infant's profound hunger for food, security and love, its "wholeness" of brain response and the widespread processes underlying conditioned reflexes, it would surely be naïve to suppose that continued frustration could not have far-reaching consequence.

Down the ages nature has evolved in man speech based on the control of expiration and inspiration through optimum crying. The intrusion of long bouts of both subvocal and expressed crying must inevitably interfere with orderly maturation.

The Asthmatic Attack

The foregoing account of the "cry" has outlined four salient features.

(1) A change in respirations involving quick inspiration alternating with prolonged expiration.

(2) An involvement of accessory muscles used in arms, legs, neck and abdomen.

(3) The use of the cry as a recorder of moods and a step towards the development of speech.

(4) The existence of subvocal crying.

If the "cry" is mould for the "asthmatic attack", one would expect close resemblances. Observation shows that they are present.

1. *Respiration.* Changes in respirations are easily recognizable during an attack of asthma. The disturbance in the rhythm is so pronounced as to produce discomfort: sometimes it creates terror.

Osler (1910) gives the following concise account: "On inspection the thorax looks enlarged, barrel-shaped, and is fixed, the amount of expansion being altogether disproportionate to the intensity of the inspiratory movements. The diaphragm is lowered and moves but slightly, inspiration is quick and short, expiration prolonged."

2. *Accessory Muscles.* The accessory muscles are definitely involved. Observation, or better still the personal experience of an asthmatic attack, reveals a mass spasm of muscles from the thighs to the neck, indeed to the corrugators of the eyebrows. The whole body feels fixed as though held in an invisible vice.

It is noteworthy that the attention of most observers has been focussed on sounds and facial appearance in crying, and on the distressing involvement of the tract from glottis to bronchiole in asthma. The matter of accessory muscles seemed to have little relevance. Its persistence, however, is a valuable pointer to a common origin, with differences modified by circumstance. The crying infant,

because unable to rise from a prone position, is free to move both legs and arms, whereas the asthma patient holds himself rigid in a semi-recumbent posture in order to facilitate breathing.

The work of the Asthma Research Council of Great Britain (1949) has a bearing on the problem. It has evolved the well-known series of exercises involving back, legs, arms and neck, together with abdomen and thorax. Virtually it presumes physiological breaking down of the whole mass pattern of asthmatic respiration into component parts and control by re-education.

The success of the treatment is evidence that the accessory muscles are not mere sleeping partners or vestigial reminders, but important factors in the asthmatic state.

3. *Association with Mood.* Testimony concerning involvement of emotions in asthma is voluminous. Asthmatic attacks arrive and depart with annoying variability. Change of house or environment may show mysterious benefits. Inconsistencies to therapy are notorious. The cure of today may in the same person be useless tomorrow.

There is reason for the feature of unpredictability. Case after case shows that frequently cure does not depend upon medicine, house nor environment, but on the psychological make-up of the person, and vagaries of temperament and emotion so aptly epitomized by Scott in his *Lady of the Lake*—

“Fantastic as a woman’s mood
And fierce as frenzy’s fever’d blood.”

Finally, if we review the influences which make a baby cry, there is a curious similarity to the incidents which trigger the asthmatic attack. Hunger, injury, overfeeding are common to both. We may exclude the tight binder and nappies, but not being “wet to the skin” or “being cold”. Nor can we eliminate the most obvious cause which is insecurity. There is no chance of our falling from the hand of a nurse, but “falling into difficulties” is common place in the life of an asthmatic.

A linear association between the mood and emotional trials of infancy and adulthood is in existence. The asthmatic has had the ill-luck to keep the line unusually open.

4. *Subvocal Asthma.* In dealing with crying, reference was made to subvocal crying or crying without crying. It is equally correct to speak of subvocal asthma or “asthma without asthma”, since an asthmatic state can exist without classical features.

The patient has the sensation that there is a constriction of breathing and a tensing of the auxiliary muscles as if an asthmatic attack is about to occur, yet there are no outward manifestations.

The existence of such subjective sensations is further evidence of the intimate relation between infantile crying and asthma. Both can exist on a plane which seeps into the subjective level, but does not reach the stage when manifestations are visible to an onlooker.

Crying without Tears

If asthma is regarded as the frozen pattern of an infantile cry, can we pin point the time of origin? At first sight this seems difficult, since crying occurs at any age.

The significance of the fact that crying with tears does not occur in the majority of babies until the third month is now apparent. As the asthmatic does not weep in an attack, it is probable that the pattern is laid in the early months of infancy. This is in keeping with the incidence of bottle feeding and

rejection, operative in the same period. Additional data concerning a "tears" relationship arises from the curious clinical finding mentioned by Abramson (1951), that many "asthmatics" are unable to cry.

A personal memory is that of seeing screamingly funny situations in which the onlookers literally cried with laughter, whereas for an asthmatic onlooker the incident merely precipitated a tearless asthmatic attack.

Not infrequently the cure of asthma is heralded by the commencement of an ability to weep.

Crying Level of the Pre-asthmatic

A history of excessive vocal and subvocal crying in infancy by asthmatics would shed some light on the problem of aetiology. Unfortunately we are largely dependent upon the critical memories of mothers, and must not forget that the normal baby cries. Subvocal crying is not obvious to the onlooker.

It is our impression that there is an undue number of overcrying babies in the ranks of future asthmatics. A preliminary enquiry of 70 mothers of asthmatics at the Brisbane Children's Hospital revealed an overwhelming percentage of "cry babies", but as the social worker observer says, it is difficult to know if the mothers are saying things to please the doctor. Such an investigation needs controls. However, on other grounds it seems likely that the crying habits of the future asthmatics are abnormal.

Illingworth (1955) in a recent paper has stressed the importance of insecurity, loneliness and love hunger as causes for crying in infants and children.

Viewed from this aspect, it would seem extraordinary if a baby subjected to influences accompanying rejection or submergence were expected to have an ideal crying pattern.

Requisites for the nest and obstacles to its achievement can be easily visualized:

The nest demands not merely constant day and night vigilance, but also a frequent outpouring of affection when baby is awake. The latter will be achieved by crooning, tickling, playful pinching, rocking, rolling and holding by a smiling mother who thereby gives daily lessons towards the goal of a relaxed mind in a healthy tensionless body.

The mother faces several difficulties. Constant strain of good intentions leads to irritability and exhaustion. Maternal tension conduces to tense handling. This creates feelings of "insecurity" in the child.

A rejecting "unconscious" brings on episodes of forgetfulness. Mother tends to forget mistakes and unpleasant chores. There are repercussions because response to baby's needs is tardy. Rejection, whether primary or secondary as in submergence, sows the seeds of guilt from which the mother tries to escape by overcompensation, thus coddling the child in a cotton wool envelope of oversolicitude. Rejection has psychosomatic repercussions including lessened flow of milk in breast feeding. As lactation is a "natural" for the creation of an adequate nest, the mother is deprived from the outset of a stabilizing activity.

One must conclude that the interaction of such handicaps, even in the well-intentioned, amounts to a vicious circle having repercussions in the nest.

PHASE 2 OF THE ASTHMA SYNTHESIS

THE ORGANIC AND PSYCHOLOGICAL FACTORS

The foregoing sections have outlined a broad background of infantile insecurity associated with interference in respiratory control whereby instinctive

crying develops into speech. Natural growth requires an optimum incidence of crying. Too much throws the sequence out of gear, and tends to perpetuate an immature pattern reaction with undesirable results.

Events which create early insecurity, whether by early weaning, maternal rejection or prolonged discomfort as in dermatitis, predispose to asthma at a later date. Thus asthma can be regarded as an end product of faulty respiratory maturation in infancy, but it would be entirely incorrect to consider that this is sufficient to create a "fully-fledged asthmatic". A baby can be bottle fed, rejected, submerged, or have prolonged discomfort without subsequent asthma.

At least two further factors must impinge upon the line of maturation. The first is an organic condition which triggers the infantile pattern. The second is an asthmagenic environment which keeps alive and often accentuates the primal insecurity. The possibility of a third factor in the possession of an inborn personality type must be considered, and is under investigation. It will be the subject of a further communication.

The relationship of the first three factors can be graphically described thus:

Phase I	{	Primitive Speech	}	A
		Maturation		S
Phase II	{	Organic	}	T
		Respiration		H
		Factor	}	M
		Psychological		A
		Insecurity		
		Factor		

Whilst the primitive speech maturation factor has chronological precedence, the others are of no less importance. Just as powder, bullet and trigger are essentials in firing a rifle, so must an organic respiration factor and psychological insecurity factor be present to reach the target of asthma.

The Organic Factor

It has long been known that eczema or bronchitis can initiate an attack of asthma in an asthmatic, and that a lung damage group occurs in which it is said to be a direct sequela to respiratory infection or allergy.

Occupational asthma is associated with a wide variety of textile products including cotton, fungi and chemicals, notably salts of platinum. Whilst the recognition of an organic factor is universal, the strange interplay of causes which include the allergies, endocrines and psychological states create an overall vagueness. This is accentuated by the unpredictable variability of asthma in time, place and severity.

In our series there is a clear-cut picture of an associated organic factor. Thirty-seven children have a history of major respiratory tract infections.

Repeated bronchitis	..	..	..	..	..	37
Repeated bronchitis with frequent colds	..	..	..	..	30	
Repeated bronchitis with croup	..	..	..	..	6	
Repeated bronchitis with whooping cough	..	..	..	..	1	
Repeated bronchitis with frequent colds and pneumonia	..				3	
Repeated bronchitis croup	..	..	..	..	1	

One child had no major respiratory tract infection history, but suffered from

dermatitis and presented the classical signs and symptoms of an asthma-eczema-prurigo syndrome. He had been characteristically over-coddled. It seems likely that by "submerging" devotion, discomfort of the dermatitis contributed to the result. Eight cases revealed the incidence of infantile eczema. All, with the above exception, had co-existent respiratory tract infection.

From the evidence it can be inferred that if NO ORGANIC FACTOR was present there would be no asthma. The organic factor acts as a trigger stimulus which sets in action the infantile cry prototype.

Types of trigger stimuli are varied. In addition to the infections, cold air impinging on the nasopharynx was undoubtedly present at the onset of one case under observation. Noxious fumes acted in a similar capacity. Herxheimer (1946) has reported voluntary hyperventilation as a trigger agency.

Professor L. J. Witts (1938) drew attention to gratitude earned in the cure of this disease, only to be followed by discouragement with the subsequent relapse. He referred to Rackemann's simile of the still loaded gun and a fresh trigger firing off new attacks.

It will be noted that physiological processes are included in the organic category. The line of demarcation is not clear cut as in the case of "cold" which can initiate physical change. The hair line is clearly apparent in allergy.

Allergy

The role of allergy in asthma cannot be ignored. In this series many asthmatic children showed allergic reactions to various substances. Twenty-one out of 38 gave positive findings when skin tested. This indicated the frequent coincidence with allergy, but it does not necessarily indicate a causal relationship.

The allergic patient who studies his allergies through the years realizes variance with time and circumstance. There is a relationship both to fatigue and emotion. The allergic manifestation appears to be the culmination of a series of incidents, some of which may be purely psychological.

The importance of maturation has been mentioned. The goal of human development is a working psycho-chemical balance. Basic preliminary steps are taken towards this in the first weeks of babyhood. If the psyche is overcharged with insecurity, there could be unbalance of the endocrine glands leading to chemical change of far-reaching importance. An allergic diathesis might actually stem from the same factors which lead to the asthma synthesis. Such a concept is implied by those who stress the importance of psyche in allergic manifestations.

Wittkower and O'Neill (1953) found that in a controlled group of hay fever patients marked character changes occurred, with a tendency to self consciousness and hypersensitivity. Traits of seriousness, ego-centricity and ambition persisted into adult life. The individuals tended to be efficient, conscientious, meticulous and perfectionist. One might ask:

Whether allergy produces personality changes, or does an adverse psychology create allergy? On the other hand, do they merely overlap in certain people? Can there be a basic fault which produces both character and allergy?

Allergy undoubtedly plays an important part in the attacks of coryza, bronchitis and eczema, since there can be a direct relationship to asthma through extrinsic organic factors. It would not be correct to say no allergy, no asthma, but rather allergy often contributes much to the trigger mechanism.

Attention must be drawn to an observation by Dr. Humphry (1955) concerning 7,000 aboriginal patients. The universality of breast feeding and the absence of asthma were noted. He stated that hay fever is unknown, and skin

allergies are uncommon. The only cases of the latter were caused by drug sensitivity.

Psychological Insecurity Factor

The third factor of psychological insecurity has not escaped recognition by those writers who mention anxiety and emotional conflict as of importance, but the position has been obscured largely because asthma occurs as a different problem in different age groups. The physician sees the adult asthmatic as a result of a long process of facilitation. The passing of years has severed the psychological links with infancy.

The paediatrician is faced with the difficulty of disentangling the problems of the first year from others which occur in such rapid succession in childhood.

In many ways the psychological problems of childhood and adulthood differ so greatly that reconciliation is impossible until they can be resolved into a common formula. The chief psychological problem of infancy is how to deal with insecurity. It is a problem which not infrequently must be faced in older age groups.

Can insecurity be the conditioning lever which links both child and adult to the immature breathing and crying controls of infancy? In order to test this, investigation of the asthmatic children and mothers in this series should produce evidence.

The first approach to the child is by the simple expedient of asking him for an opinion of his problems. Diffidences and inabilities of descriptive powers are at once encountered. Loyalties and fears make him tongue tied. The physician cannot rely on this type of investigation, and the resources of a psychological laboratory must be made available.

In order to obtain uniformity, only three tests were used in this research—Murray's "Thematic Apperception Test", a Projection Test using miscellaneous toy material, the Lowenfeld "Worlds" arranged in a sand pit.

The tests were given to 36 children. All showed involvement in conflict situations with the mother. This was expressed predominantly in the T.A.T. with 18 positive references, while there was dramatic presentation of the same theme eight times with toy material, and ten times in the "Worlds".

Among the responses to the T.A.T. pictures were frequent refusals to identify mother figures, as well as death wishes towards her and actual killings. Twenty-three children declared a longing for rest and freedom, T.A.T. 16, Toys and "Worlds", 6. Rebellion against parental planning was revealed 17 times in T.A.T., 5 times with toy material, and 4 times in "Worlds".

The series of tests shows a child/parent situation which can best be described under the term "Insecurity". There was definite evidence of emotional tension.

The maternal approach was by questionnaire, and an analysis of the evidence pointing to undue tension on the part of the 38 mothers was significant. Fifty per cent. gave evidence of open or presumptive marital conflict. The data in the remainder was insufficient to warrant conclusions, but 24 of the wives—out of 29 about whom information was regarded as being reliably complete—were the dominant partners in their marriages.

In 29 cases evidence was sufficient to uncover the mother's own mother/child relationship. It was admitted to have been unsatisfactory in 19. No fewer than 12 mothers felt that they had been defrauded as children, whilst 16 considered they had been dominated by their own mothers. The findings are indicative of maternal tension of type likely to lead to insecurity of the child.

Four mothers were themselves asthmatics. Asthma occurred in 18 of the

maternal grandmothers. Whatever bearing this might have on the problematic hereditary factor, the incidence reflects an undoubted psychological effect upon mothers who brought to the rearing of their own children an ever-present dread of the development of asthma. This engendered a protection so encompassing as to become a miasma of frustration for the child. Also, these mothers had been given no adequate pattern in their own childhood of happy carefree mother/child relationship.

Inevitably maternal attitudes were in part patterned to this inadequate template. Old resentments harboured towards their own mothers, prompted by the premature thrusting upon them of responsibility, were reactivated when their babies' symptoms revealed the familiar demand for care and attention.

From the evidence it would seem that a state amounting to insecurity existed in the lives of all the asthmatic mothers and their children.

ASTHMA IN THE ADULT

The adult asthmatic must be considered in relationship to the aetiology in childhood. Data are being collected on this aspect. Whilst our series is too small for dogmatism, there are indications that the early prototype created by insecurity can be triggered at any age if the organic and psychological conditioning are adequate. The chronic asthmatic is an end point of facilitation and of a widening circle of sequelae which include structural distortion, physiological change and psychological dysfunction. Although this overlay of secondary elaboration confuses the issues, evidence is accumulating to suggest aetiology of asthma in adults may be based on the three primary factors of the asthma synthesis.

THERAPY

Though this research was primarily centred on the aetiological factors of asthma, consideration of prophylaxis and therapy could not be entirely excluded. In dealing with patients, its implications soon became apparent.

It seems clear that breast feeding must be encouraged. In this respect, experience shows that mothers of our asthmatics are amenable to persuasion concerning all attitudes to their children. This has repercussions in therapy, since they are willing to discuss rejection and submergence in order to mend their ways.

At all ages and stages of the asthmatic ladder, organic and psychological factors are operative. The organic will be explored in the knowledge that one or more physical abnormalities will be present, varying from a nasopharyngeal infection or allergy to an over full meal taken in the evening.

Importantly, there will be the probability of a psychological state of insecurity. This gives an opening for frank discussion. A conflict can be resolved, or an environmental difficulty removed. Not the least of the annoyances to the asthmatic is the mystery which underlies his illness. The patient awaits with fear the next unpredictable episode. A conception of asthma, which permits the patient to understand the origins of his complaint and to search for underlying insecurities, gives surprising relief. This has been observed in adults with long standing asthma.

There is no suggestion that the above will remove the need for drugs and physiotherapy, but it offers material assistance.

The diagnosis of asthma, particularly in children, is not always easy. When in doubt, an absence of one or more of the cardinal factors discussed

above has a significance. As Illingworth (1955) points out, diagnosis of asthma is made too easily, and may lead to neglect of the underlying condition.

SUMMARY

(1) A survey of 38 asthmatic children was undertaken to ascertain whether disturbed maturation involving co-ordination of respiration and speech is involved in the aetiology of asthma. This is substantiated.

(2) Asthma is regarded as a synthesis involving the three factors of primitive speech maturation, organic involvement in respiration, and psychological insecurity. Two stages are involved.

(i) *Basic Stage:*

Orderly maturation of the respiratory system utilizes the primitive speech mechanism of "crying" as a basis for respiratory control in true speech.

Insecurity of the child as in maternal rejection, psychological submergence, or prolonged discomfort as in dermatitis alters the infantile crying rhythm, thereby producing interference with maturation. A template is thus created for the eventual attack of asthma. This is the first or basic stage. Bottle feeding is often linked with rejection in the creation of insecurity.

(ii) *Trigger Stage:*

Two factors are involved in a subsequent trigger stage. The first is an organic involvement of the respiratory system. Allergy is often contributory. The second depends on a psychological state evoked by feelings of insecurity. It would appear that the presence of both factors constitutes a trigger mechanism which evokes a modification of the unmaturation "cry".

(3) There is evidence that the same aetiological factors which are involved in asthma of childhood occur in adults.

(4) The psychological significance of rejection, submergence and breast or bottle feeding are surveyed.

(5) The inability of certain asthmatic patients to "cry" is discussed.

(6) The possibility of an inherited type of personality, being a predisposing factor, is under investigation.

(7) The existence of objective and subjective phases in crying and asthma is considered.

(8) Implications in therapy are reviewed.

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MODIFICATION OF INSULIN RESISTANCE*

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SAKEL (1938a) drew attention to the difficulty of establishing satisfactory comas in a minority of patients attending for Deep Insulin therapy. This phenomenon has since been confirmed by other workers including Tillim (1938) whose patient received 500 units of insulin without the production of deep coma, by Hall (1940) who reported an instance in which 1,000 units of insulin was equally unsuccessful, by Reznikoff and Scott (1942) who described how neither 120 nor 1,000 units of insulin when injected intravenously produced any significant difference in hypoglycaemia in insulin resistant patients, and more recently by Fogarty (1953) whose case required 5,000 units of insulin for the production even of sopor. Other recorded examples of resistance to massive doses of insulin include those of Banting *et al.* (1938) and Tennent (1944).

Various explanations of this perverse response to insulin have been formulated, including that of Jones (1939) who proposed that resistance to insulin was both a problem of true insulin insensitivity and also of an anomalous response of the central nervous system to hypoglycaemia. Meduna *et al.* (1942) preferred to ascribe it to anti-insulin factors in the blood, but a more interesting interpretation derived from Freudenberg (1952) who suggested that if the effects of high insulin dosage employed in insulin coma treatment were regarded as a special instance of a stress response, then the fluctuations and differences in response could be equated in terms of the General Adaptation Syndrome of Selye. High doses were thus an index of an effective "alarm stage" characterized by a discharge from plentiful adrenocortical reserves.

A number of techniques have been subsequently evolved to surmount coma resistance and include that of Sakel (1938b) who found that coma could be produced on subsequent treatment days by the production of epileptic seizures with metrazol about the third hour of hypoglycaemia. He reaffirmed this (1950), further emphasizing his preference for metrazol rather than electrically induced convulsions. Stell (1945) expressed similar satisfaction with an identical regime. Other modified hypoglycaemic procedures are those of Kant, who introduced the divided dose schedule, and of von Braunmühl, who devised the "zig-zag" method. Kalinowsky and Hoch (1946) report very favourably on this latter procedure, remarking that they rarely find it necessary to employ more than 200 units of insulin to produce coma: unhappily this is not a universal experience. Other workers have given sedatives on the evenings prior to treatment, stilboestrol to male patients in the mornings before therapy, or enteric coated tablets of ammonium chloride throughout the day, all in the hope of reducing resistance to insulin. Goldberg and Jefferies (1946) suggested that nicotinyl taurine may provide a relatively non-toxic synergist to reinforce the insulin effect in insulin resistant cases, but their experiments were confined to rabbits.

In view, therefore, of either the inefficacy or time consuming nature of the

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accepted methods for surmounting insulin resistance, it was decided to see if a more satisfactory solution of this problem could be attained by attempting to modify the activity of the prime insulin antagonists. These are the anterior pituitary and adrenal cortical hormones (Bouckaert and de Duve, 1947) which are also alleged to increase resistance to a variety of non-specific stressors (Selye, 1950a).

Of course, increase in sensitivity to insulin follows sympathectomy or adrenalectomy (Lewis, 1923; Sundberg, 1923; Hallion and Gayet, 1925; Cannon *et al.*, 1924; Britton *et al.*, 1928; Dworkin, 1931; Brooks, 1934; Zucker and Berg, 1937; McDonough, 1939; Crandall and Cherry, 1939) or as the result of the administration of blocking agents such as ergotamine (Burn, 1923; Schlossberg *et al.*, 1933) or hexamethonium bromide (Schachter, 1951; Laurence and Stacey, 1951).

However, Swann and Fitzgerald (1938) showed that the adrenal cortex was of considerably more importance in the reaction to insulin than was the adrenal medulla, and as Vogt (1947) demonstrated that the reaction of the adrenal cortex is independent of the integrity of the adrenal nerves, whereas that of the medulla is dependent, the administration of a drug such as hexamethonium bromide could not at first sight be expected to lead to any modification of adrenal cortical activity.

But Selye postulated a unified response to stress and emphasized its triphasic nature (1950b). The complex embracing these three stages he termed the General Adaptation Syndrome (1946) the first part of which is the alarm reaction in which adaptation has not yet been acquired. An agent producing such an alarm reaction was termed a stressor (Selye, 1950c) and might exert both specific and non-specific effects (Selye, 1951). Insulin acts both as a non-specific stressor, and also specifically by increasing the peripheral assimilation of sugar and the deposition of glucose in the liver (Soskin, 1941; Bouckaert and de Duve, 1947).

As it is recognized that the systemic stress effect of various alarming stimuli can be summated (Selye, 1938; 1950d) and that an increase in the alarming effect of two simultaneously applied agents has been confirmed for other combinations of stressors (Frank, 1940; Laugier and Leblond, 1943; Friesen and Wangenstein, 1946) it was decided to combine insulin with a stressor, the rationale being, that as both involve corticosteroid utilization, the alliance of the two might induce a relative deficiency of corticoids with reduced antagonism to insulin.

It has also been shown that syncope produced by administering hexamethonium to an erect patient is associated with the changes typical of an alarm or stress reaction (Marley, 1953). Consequently, insulin and syncope induced with hexamethonium was taken as one combination of stressors. Other recognized stressors include histamine (Sayers and Sayers, 1947) and electroplexy (Cleghorn *et al.*, 1948) so a few modifications of hypoglycaemia were attempted by combining these separately with insulin. In addition, "prisco" was occasionally administered with hexamethonium, on the supposition that the summation of their adrenergic and ganglion-blocking properties might modify the reaction to hypoglycaemia.

Now it was previously proposed that the combination of stressors might lead to an inflated corticosteroid utilization. In particular, as the 11-oxysteroids are not only insulin antagonists but are also implicated in resistance to stress procedures (Talbot *et al.*, 1947) and in protecting adrenalectomized animals against circulatory failure (Swingle *et al.*, 1942) it would seem reasonable to

surmise that the introduction of an artificial and additional stress during hypoglycaemia vastly implements the body's requirements for such hormones. In fact, Wiggers (1950) suggested that various stresses might lead to an excessive demand for corticosteroids which was not met by an augmented liberation of these substances, and Selye (1946) went so far as to say that the shock phase of the alarm reaction was one of relative adrenal insufficiency. Sayers and Sayers (1947; 1948) also claimed that stress inevitably results in a greater utilization of adrenal cortical hormones. Certainly recent work by Bliss *et al.* (1954) has demonstrated that both insulin coma and electroplexy are accompanied by significant alterations in the level of the blood steroids.

Evidence is also available that shock or shock-inducing stimuli strongly disturb carbohydrate metabolism (Green and Bullough, 1950; Green and Ghadially, 1951) and that an increased demand for carbohydrate is the first effect of stress in general (Engel, 1949). Russel *et al.* (1944) suggested that during shock, the carbohydrate metabolism of the peripheral tissues is probably anaerobic yielding less energy, and obviously this spate of carbohydrate metabolism decreases the amount obtainable by the brain (Engel, 1945). A reduction of the hepatic glycogen also occurs during shock and has been observed in both man and animals (Lambert and Driessens, 1937; Jourdan *et al.*, 1943; Haist and Hamilton, 1944; Nastuk, 1947). Therefore, stress with its ensuing disappearance of hepatic glycogen, extreme protein catabolic impulse and augmented peripheral assimilation of glucose, must further hamper the endocrine adjustment of the insulin antagonists to hypoglycaemia, particularly as it is known that the anterior pituitary and adrenal cortical hormones act mainly by inhibiting the peripheral oxidation of glucose and by stimulating hepatic gluconeogenesis (Engel, 1945).

Himwich (1951a) describes three mechanisms functioning to prevent the complete cessation of brain metabolism during hypoglycaemia. These are: (1) the formation of glucose from cerebral glycogen; (2) the release of hepatic glucose to the blood stream, and (3) a change in utilization from glucose to fat by non-nervous tissues, thus saving the blood carbohydrate for the brain. A comparison of the three mechanisms revealed the second to be of the greatest value to the organism, for it not only acts over a longer period than the first, but is quantitatively the more important. He qualifies this statement by commenting that the efficiency of the second mechanism depends chiefly upon the amount of glycogen in the liver. If the above reasoning be true, then the introduction of additional stress must so expedite the second mechanism, that by the time the large quantities of insulin have been absorbed from the injection site, it will be less effective and the functions of the relatively unimportant first and third mechanisms thereby facilitated in an effort to maintain adequate cerebral metabolism.

METHODS

Hexamethonium bromide was administered either parenterally or intravenously to recumbent insulin resistant patients being treated with Deep Insulin, or given intramuscularly to similar patients stood erect in an attempt to produce syncope, sensitivity to the drug having been determined beforehand. It would be injected with the insulin at 7.30 a.m., the average dose of hexamethonium being 100 mg. administered either subcutaneously or intramuscularly, the maximum dose employed being 200 mg. Intravenous injections of hexamethonium were only utilized in the earlier attempts at modifying hypoglycaemia, with a maximum dose of 50 mg. injected approximately 90 minutes after the insulin had been acting.

The technique of inducing syncope involved making the patient stand erect and quite still immediately after the injection of the hexamethonium and supported by two attendants. In this series, syncope was usually induced within 15 minutes of the injection of the hexamethonium; should it not occur, then the patient would be returned to bed, and in certain instances a subsequent attempt at syncope was made, usually within the following 30 minutes. After collapse, it was the routine policy for the patient to remain propped up in bed, so that the maximum effect of gravity was exerted upon the circulation. Frequent assessments of the blood pressure and the pulse rate were recorded, and an emergency tray containing methedrine and coramine was available if required. By these tactics, therefore, a temporary phase of circulatory embarrassment could be produced at will, but it seemed more discrete to induce this state early in hypoglycaemia, rather than have it coincide with the altered cardiovascular dynamics that attend the later stages of hypoglycaemia. In order to record these changes more accurately, Grant and Reeve's classification of Circulatory Patterns was adopted (Grant and Reeve, 1951). The only patterns observed in this series were the Vaso-vagal and that of Warm Hypotension, so these only will be elucidated: the Vaso-vagal pattern includes a low blood pressure, slow pulse rate, cold extremities and a pale face, the patient frequently experiencing nausea; that of Warm Hypotension presents with a blood pressure and fast pulse rate, but is accompanied by warm extremities and a face that might be flushed, well-coloured or pale. Such patterns were only deemed to be present if they persisted for at least 15 minutes after the production of syncope. On the other hand, the brief Vaso-vagal patterns that presented in the majority of cases immediately after syncope were not recorded.

Histamine was another drug employed in an attempt to modify insulin resistance, and this was administered intravenously to recumbent patients having Deep Insulin at 7.30 a.m. the individual's sensitivity to the drug having been previously ascertained and a history of former allergic phenomena excluded. Doses of up to 2 mg. were used. In some of the earlier modifications of hypoglycaemia, "Priscol", orally or intravenously, was combined with hexamethonium and insulin. On one occasion, modification of hypoglycaemia was attempted with electroplexy.

Control hypoglycaemic reactions were recorded on the majority of occasions, either before or soon after the initial modified hypoglycaemic technique for comparison with it. In order to confirm an impression that a certain drug was capable of significantly modifying hypoglycaemia, patients were rested for some days from Deep Insulin therapy previous to both the control investigation and the modified hypoglycaemic procedure. Later in the series when hexamethonium had proved its value, these rest days were omitted. Blood-sugar levels were checked during some of the modified hypoglycaemic reactions, but as it is widely recognized that there is little correlation between the symptoms of hypoglycaemia and the amount of glucose in the blood (Himwich, 1951b) no great importance was attached to the results that were obtained. The blood sugars were determined by the method of Herbert and Bourne (1930) which is an estimation of the true blood sugar. Attention was also directed to the fluctuations and clinical transitions of hypoglycaemic levels, to pulse rate recordings, blood-pressure readings and occasionally to alterations in the eosinophil counts. Blood for the latter was withdrawn at 9 a.m. and 1 p.m. as it has been demonstrated that hypoglycaemia is accompanied by an eosinopenia (Perlmutter *et al.*, 1951) which is most prominent four hours after stress. The first count was performed at 9 a.m. as it is known

that following the eosinopenia during the early hours of the morning, the count tends to become stabilized about 9 a.m. (Rud, 1947). Capillary blood was used in eosinophil counting, and both the technique and the phloxine-urea diluent proposed by Manners (1951) were adopted.

The classification of hypoglycaemic levels as suggested by Frostig (1940) was used in a slightly modified form, in order that the transitions from one hypoglycaemic level to another could be described with more precision than would have been possible if the standard descriptive terms of sopor and coma had been employed. Thus Stage 1 Hypoglycaemia represents the earliest detectable clinical phenomena following the latent interval after the injection of insulin and is accompanied by perspiration, salivation and some degree of somnolence. Stage 2 Hypoglycaemia presents with speech and perceptual disturbances, clouded consciousness, fine tremor and motor excitement. Stage 3 Hypoglycaemia is equivalent to sopor, that is the loss of consciousness with the appearance of motor restlessness, clonic twitchings, choreiform and hemiballistic movements; Stage 4 Hypoglycaemia represents the release of the mid-brain from higher control and is characterized by the depression of pyramidal functions with increased tone, tonic spasms and tetanic postures. Stage 5 Hypoglycaemia is equivalent to coma, with the presence of postural reflexes, pin-point pupils that exhibit no reaction to light and corneal reflexes that are either very much reduced or absent.

The definition of insulin resistance was arbitrary, and it was assumed to be present when a patient exhibited no more than a Stage 3 Hypoglycaemia following the injection of approximately 500 units of insulin. Ten such cases of insulin resistance were encountered, but for the purpose of brevity only five are reported in detail, a synopsis of findings for the rest of the patients being included in Table I.

The case numbers adopted are those allocated originally to the 35 patients treated with Deep Insulin, the results of which are examined more fully in the thesis from which this paper is abstracted. The patients were all males suffering from schizophrenia. Those found to have hypertension, cardiac dysrhythmias or other heart disease were excluded, even had they been fit enough for Insulin therapy.

RESULTS

Case 21. Catatonic Schizophrenia. Age 23.

This patient had evinced no progression beyond a Stage 2 Hypoglycaemia with as much as 440 units of insulin, but the identical dose of insulin combined with 150 mg. of hexamethonium bromide and the induction of syncope early in hypoglycaemia (23.8.52), resulted in a satisfactory coma. He was subsequently rested from Deep Insulin until 1.9.52, when a control investigation was performed; this entailed the injection of a larger dose of insulin (480 units), but led only to the appearance of a Stage 2 Hypoglycaemia. Again he was rested from Deep Insulin until 4.9.52, when 200 mg. of hexamethonium was injected subcutaneously, the patient being recumbent. The insulin dose was 440 units, and besides the production of a Stage 5 Hypoglycaemia, a marked Vaso-vagal circulatory pattern emerged. In both the above modifications of hypoglycaemia, the pupils were widely dilated during coma. The modification of hypoglycaemia with 1 mg. of intravenous histamine (8.9.52), was not followed by coma.

Case 24. Simple Schizophrenia. Age 27.

This patient was proving resistant to insulin, for by 18.9.52 the injection of 480 units of insulin was succeeded only by a Stage 2 Hypoglycaemia. He was therefore rested from Deep Insulin therapy until 23.9.52, when the combination of 400 units of insulin with a divided dose of 125 mg. of hexamethonium and the introduction of syncope early in hypoglycaemia resulted in a Stage 4 Hypoglycaemia, a circulatory pattern of Warm Hypotension occurring subsequent to the syncope. Although satisfactory comas were recorded on the treatment days immediately following this procedure, by 29.9.52 the insulin dose had once more increased to 520 units to induce merely a Stage 2-3 Hypoglycaemia. So on 2.10.52, 400 units of insulin were combined with 1 mg. of histamine injected intravenously, followed by a later dose of 0.5 mg. of intravenous histamine, and an adequate coma ensued. Following this, comas occurred regularly

until 13.10.52, after which the administration of as much as 560 units of insulin led consistently to no advance beyond a Stage 4 Hypoglycaemia. The combination of 480 units of insulin with a total dose of 1.5 mg. of intravenous histamine on 20.10.52 was this time ineffective, but the same dose of insulin combined with 100 mg. of hexamethonium and an attempt at producing syncope (21.10.52), produced a satisfactory coma, the pupils again being widely dilated. The recovery following termination was without incident until the patient stood up to dress himself, whereupon he suddenly collapsed, and on examination a few minutes later was discovered to have returned to a Stage 3 Hypoglycaemia requiring interruption with an intravenous injection of glucose solution. Regular comas occurred after this modified reaction, although the dosage of insulin requisite for producing adequate comas still remained at 440 units.

Case 30. Schizo-affective Illness. Age 26.

It was obvious that this patient would require a high coma dose, as on 3.1.53 the insulin dose was 520 units which did not produce any progression beyond a Stage 2-3 Hypoglycaemia. He was therefore rested from Deep Insulin therapy until 8.1.53, when the identical dose of insulin was combined with 100 mg. of hexamethonium bromide and syncope induced early in hypoglycaemia. A satisfactory coma ensued, accompanied by the emergence of a Vaso-vagal circulatory pattern after the injection of the hexamethonium. However, no comas were recorded in the succeeding treatment days, and as it had been necessary by 14.1.53 to increase the insulin to 680 units with still no development beyond a Stage 3 Hypoglycaemia, the insulin dose was swung from 80 units (16.1.53), up to 720 units (23.1.53), satisfactory comas occurring on 20.1.53 (600 units of insulin), and 22.1.53 (680 units of insulin). As no further comas developed by 27.1.53 with as much as 640 units, the patient was therefore rested from treatment until 29.1.53, when the dose was reduced to 520 units combined with 100 mg. of hexamethonium bromide and a syncope induced early in hypoglycaemia, but no progression beyond a Stage 4-5 Hypoglycaemia resulted, although once again the pupils were observed to be widely dilated. Even though this stratagem was not completely successful, regular comas were recorded with 680 units of insulin after 31.1.53.

Case 33. Hebephrenic Schizophrenia. Age 31.

This patient was manifesting extreme insensitivity to insulin, for during a control investigation on 23.6.52, the injection of 560 units of insulin resulted solely in a Stage 1 Hypoglycaemia. However, the combination of 560 units of insulin with 100 mg. of hexamethonium on 19.6.52, the patient having been rested from Insulin therapy since 14.6.52, led to a Stage 5 Hypoglycaemia. This was interrupted with a routine tube-feed of glucose solution, but as the patient showed no evidence of recovery some 30 minutes later a further 100 c.cs. of 33 per cent. glucose solution was injected intravenously after which he slowly recovered consciousness. On the day following the control test (24.6.52), although the insulin dose was reduced to 480 units, this combined with hexamethonium bromide, resulted in an adequate coma. However, on 25.6.52, 560 units of insulin by itself failed to achieve more than a Stage 2 Hypoglycaemia. The combination of insulin with a total dose of 1.5 mg. of histamine injected subcutaneously on 26.6.52 was also unsuccessful, and an increase of the insulin dosage up to 640 units (28.6.52), ended in no progression beyond a Stage 2 Hypoglycaemia. It was then decided to reinstitute Modified Deep Insulin therapy on 30.6.52 with 440 units of insulin and 150 mg. of hexamethonium bromide, the hexamethonium given subcutaneously, followed by a later and additional increment of hexamethonium bromide injected intravenously, but no coma ensued. The insulin dose was therefore swung from 80 units (2.7.52), up to 600 units (5.7.52) and on this last occasion a coma occurred. However, in an effort to reduce the total dose of insulin, 150 mg. of hexamethonium was combined with 480 units of insulin on 8.7.52 and an attempt was made to produce syncope. This was not realized, but the subsequent tally of events was remarkable for the swift onset of a Stage 5 Hypoglycaemia and it was of additional interest that regular comas followed this modified procedure with 400 units of insulin.

Case 34. Paranoid Schizophrenia. Age 21.

This patient was resistant to insulin, for by 19.1.53 there had been no development beyond a Stage 2 Hypoglycaemia with as much as 560 units of insulin. The dose was therefore reduced on 20.1.53 to 480 units of insulin combined with 100 mg. of intramuscular hexamethonium and followed by syncope. A Stage 5 Hypoglycaemia ensued, but although the insulin dose was increased on subsequent treatment days, the next coma to be recorded was on 24.1.53 and followed the injection of 680 units of insulin. For this reason, an electrically induced convulsion was given immediately after the injection of 480 units of insulin on 27.1.53, but on this occasion there was not even the development of a Stage 1 Hypoglycaemia. Therefore, on 29.1.53, 480 units of insulin were combined with 100 mg. of hexamethonium and a syncope induced early in hypoglycaemia, but this too was unsuccessful as only a Stage 4-5 Hypoglycaemia resulted. The insulin dose was then further increased, so that on 3.2.53 the dose was 640 units, but this ended only in the appearance of a Stage 4 Hypoglycaemia. It was therefore decided to reinstitute Modified Deep Insulin therapy, and on 4.2.53 the insulin dose was reduced to 560 units and combined with 150 mg. of hexamethonium bromide, a syncope being induced early in hypoglycaemia. Once more there was no progression beyond a Stage 4 Hypoglycaemia, but comas were recorded regularly after this with 640 units of insulin.

As mentioned previously, a simplified synopsis of the results for the modification of insulin resistance encountered in the other five patients is presented in Table I.

TABLE I

A Synopsis of the Data Relating to the Modification of Insulin Resistance in an Additional Five Patients

Case No.	Control Hypoglycaemia	Modified Hypoglycaemia
7	The injection of 480 units of I.M. insulin was followed by merely a Stage 1 Hypoglycaemia (2.1.52).	A Stage 5 Hypoglycaemia followed the combination of 360 units of I.M. insulin with 100 mg. of sbct. hexamethonium bromide, the patient being recumbent (14.1.52).
29	A Stage 3 Hypoglycaemia followed the injection of 520 units of I.M. insulin (5.1.53).	A Stage 5 Hypoglycaemia ensued after the injection of 480 units of I.M. insulin and 100 mg. I.M. hexamethonium, syncope having been induced early in hypoglycaemia (8.1.53).
31	The injection of 400 units of I.M. insulin was succeeded after four hours by only a Stage 3 Hypoglycaemia (2.2.52).	The combination of the identical dose of insulin with 50 mg. I.V. hexamethonium and 25 mg. I.V. prisol (4.2.52); 100 mg. I.M. hexamethonium and 25 mg. of I.V. prisol (5.2.52); 75 mg. I.M. hexamethonium and 500 mg. oral prisol (6.2.52) led merely to Stage 3 Hypoglycaemias.
32	The injection of 480 units of I.M. insulin produced only a Stage 2 Hypoglycaemia (22.5.52).	480 units of I.M. insulin combined with 100 mg. of I.M. hexamethonium resulted in a Stage 5 Hypoglycaemia, the patient being recumbent (19.5.52).
35	The injection of 640 units of I.M. insulin led to merely a Stage 3 Hypoglycaemia (3.2.53).	The combination of 520 units of I.M. insulin and 150 mg. of hexamethonium with the induction of syncope, led to the appearance of a Stage 5 Hypoglycaemia (4.2.53).

The eosinopenias accompanying a few of both the conventional and the Modified Hypoglycaemias were recorded and compared, the results being presented in Table II.

TABLE II

Comparison of Eosinopenias with Conventional and Modified Hypoglycaemias

Conventional Hypoglycaemia				Modified Hypoglycaemia			
Case No.	Eosinophils per c.mm.		Eosinopenia (per cent.)	Eosinophils per c.mm.		Eosinopenia (per cent.)	Modifying Drug
	9 a.m.	1 p.m.		9 a.m.	1 p.m.		
21	160	10	94	95	35	63	Hexamethonium bromide
				111	22	80	
				117	4	96	
32	137	17	87	136	6	95	Hexamethonium bromide
33	498	160	68	320	50	84	„
34	79	3	96	84	12	85	„
35	101	10	90	108	3	97	„

From this, it can be seen that the fall of eosinophils in the modified techniques was sometimes in excess, and sometimes less, than the fall of eosinophils accompanying the control insulin hypoglycaemias.

DISCUSSION

In view of the work earlier this century demonstrating an increase of sensitivity to insulin following sympathectomy, it is not surprising that hexamethonium when administered with insulin to recumbent patients led to deeper levels of hypoglycaemia than did insulin alone. But insulin is a stressor, and as the systemic stress effect of various alarming stimuli can be summated, the combination of syncope and insulin is just such a summation of stressors. However, as sympathectomized animals are known to be hypersensitive to stress, the induction of syncope utilizing hexamethonium bromide which blocks autonomic activity might have been calamitous. Instead, the combination of insulin and syncope proved to be a practical contribution to the insulin repertoire.

Other combinations of stressors were not so successful for this purpose and in fact the electrical production of a convulsion early in hypoglycaemia was followed only by a Stage 1 Hypoglycaemia. Moreover, the application of sub-convulsive electrocerebral stimulation later in hypoglycaemia is known to rouse patients (Montagu, 1953). Histamine which is also a stressor did not potentiate the effect of insulin except when its administration was succeeded by the eventual appearance of a Vaso-vagal state. Another interesting feature was that syncope induced with hexamethonium later in hypoglycaemia had the same effect as electroplexy in that it seemed to retard progression to deeper hypoglycaemic levels. It would appear on the whole then, that stress accompanying syncope must be endowed with a separate and particular quality; certainly, the systemic stress associated with electroplexy appears to be more generalized, whereas that associated with syncope primarily involves the cardiovascular system.

The stability of cardiovascular dynamics is influenced most favourably by the 11-oxysteroids, and presumably syncope as a stress involves the increased utilization of glucocorticoids. As it is a stress involving the cardiovascular system, there is probably a particular augmented utilization of 11-oxysteroids. These and the anterior pituitary hormones are the prime insulin antagonists, and presumably the increased utilization of these in consequence of the introduction of stress procedures must decrease their capacity for resisting insulin. In addition, as the first effect of stress is an increased requirement for carbohydrate, this inflated peripheral expenditure of carbohydrate must decrease the amount available for the brain. As the action of the adrenocortical hormones and the antagonistic effect of carbohydrate occurs in the peripheral tissues (Bondy, 1949) this sudden spate of carbohydrate metabolism must further divert available corticoids and so accelerate the release of hepatic glucose that this stored reserve of carbohydrate is not later at the disposal of the body for the implementation of cerebral metabolism.

At first sight the metabolic derangement produced during stress states and that affected by insulin would appear antipodal, for during shock or stress there is increased glycogenolysis but decreased glucogenesis, whereas large doses of insulin act predominantly by augmenting glycogen deposition in the liver. But Haist and Hamilton (1944) observed that in shock conditions, insulin acts paradoxically and instead of lowering the blood sugar by promoting hepatic glycogen storage, it leads to a reduction of blood sugar presumably due to peripheral activity. However, as to whether the stressor effect of syncope

potentiates the effect of insulin by increasing the rate of peripheral glucose expenditure, by augmenting the utilization of corticosteroids or by dint of deranged hepatic function consequent to the altered blood flow to that organ (McMichael, 1938) would entail considerable intricate investigation outside the scope of this paper.

The technique of inducing syncope involved making the patient stand erect and quite still immediately after the injection of the hexamethonium. Paton (1951) noted that for a substantial time after the injection of hexamethonium, profound falls of blood pressure might be obtained in some subjects if they stood immobile for a few minutes. He considered that this hypotension was due to the relaxation of venomotor tone.

Syncope induced early in hypoglycaemia was almost invariably followed on the same day by a Stage 5 Hypoglycaemia, particularly if insulin alone had previously failed to produce comas. In those instances when hexamethonium had been formerly successful in overcoming resistance to insulin only for resistance to recur later, the subsequent modification of hypoglycaemia with hexamethonium would probably be followed at most by the development of a Stage 4 Hypoglycaemia although adequate comas were usually recorded on succeeding treatment days with just insulin.

One of the complications of Deep Insulin therapy is cardiovascular collapse, but the introduction of cardiovascular stress early in hypoglycaemia was not attended by any untoward incidents although transient Vaso-vagal patterns often succeeded the induction of syncope, more lasting deviations from the normal circulatory pattern being less common. If the state of the peripheral circulation following syncope gave cause for anxiety, the bed was blocked and this was in every instance followed by improvement of the circulation. Methedrine was always immediately available, as it is known that it accelerates recovery following vaso-vagal collapse (McMichael, 1945). No irregularities of cardiac rhythm were observed in association with the Vaso-vagal patterns, although Fulton (1949) has commented that vagal stimulation may produce all grades of atrioventricular delay and dissociation.

The hypoglycaemias modified with hexamethonium differed from conventional insulin hypoglycaemias in that the customary prominent salivation and perspiration were less evident. It is therefore topical that Paton (1951) reported that in animals the parasympathetic ganglion to the salivary glands was the most sensitive of all ganglia to the action of hexamethonium. He also commented that perspiration was depressed by this drug. A rapid transition from Stage 3 to Stage 5 Hypoglycaemia was also observed more frequently in modified hypoglycaemias, and patients who had been hitherto resistant to insulin, might in such an instance be in coma two hours after the injection of insulin and the hexamethonium. It was noted also that deep coma was accompanied by widely dilated pupils in place of the pin-point pupils that are normally to be predicted at this stage. Termination of hypoglycaemia must be by the intravenous route as the stomach does not appear to absorb fluid following hexamethonium—a fact that has some bearing on the reports that this drug interferes with the motility and secretion of the stomach (Kay and Smith, 1950; Douthwaite and Thorne, 1951). In addition, confusional states occasionally occurred after termination when these two drugs had been combined, although there were no epileptic attacks during modified hypoglycaemias. It was necessary to keep the patient in bed until late afternoon after the injection of maximum doses of hexamethonium bromide, as on one instance following a modified technique, the patient suddenly collapsed on attempting to stand and dress

himself and slid back into a Stage 3 Hypoglycaemia. Another patient developed a spontaneous syncope in the afternoon as a sequel to modified treatment.

Speirs and Meyer (1949) demonstrated that by increasing the amount of stress a greater fall of eosinophils ensued, but the eosinopenia following syncope and large amounts of insulin was sometimes in excess and sometimes less than that recorded with conventional insulin procedures, a similar variability of the eosinopenia being also found for the combination of hexamethonium with small doses of insulin.

It was feasible with this method of syncope and insulin to reduce the coma dose of insulin by between 10 and 30 per cent., but although at the time this technique seemed to enjoy considerable advantages over other established methods of modifying insulin resistance, it would now appear that the recent innovation of Straccia and Schefflin (1952) of implementing the action of insulin with hyaluronidase is, as yet, the most logical and practical approach to this problem. This is not to decry the merits of hexamethonium, for insulin resistance can be quite difficult to surmount and as Stell (1945) has emphasized, it is not advisable to wait for the patient to develop an increased and spontaneous sensitivity to insulin. Moreover, unless the patient is sensitive enough to insulin, he may fail to develop adequate comas, thereby being deprived of the maximum benefit of deep hypoglycaemias. As the phenomenon of insulin resistance has been correlated with a poor prognosis (Halpern, 1940; Freudenberg, 1952) it becomes even more imperative to ensure the development of satisfactory comas.

One of the limiting factors to the use of hexamethonium bromide is, that whilst hyaluronidase is safe and easy to administer, the combination of hexamethonium with insulin necessitates the presence of a doctor continuously in the ward from the moment the two are given, not only to deal with any untoward effects following syncope, but also to interrupt the occasional rapidly developing deep comas that occur subsequent to their use. No further side-effects of hexamethonium were observed (as have been tabulated by Harington and Rosenheim, 1954) other than those mentioned above.

Finally, although hexamethonium bromide was a useful adjuvant for modifying insulin resistance, there are other aspects to its combination with insulin. Thus the work of Funkenstein *et al.* (1952) was directed towards an assessment of autonomic readjustment resulting from shock treatments. Alexander (1953) also stressed this function of hypoglycaemia, remarking on the balanced stimulation of both the cholinergic and adrenergic divisions of the autonomic apparatus. But hexamethonium acts upon the autonomic system and if one were to accept the above hypotheses then by virtue of the administration of a blocking agent one could presumably diminish some of the benefit derived from insulin. Soskin (1941) related the therapeutic effect of excessive doses of insulin to the hypoglycaemia that accrued rather than to any stimulation of the central nervous system and as hypoglycaemia is usually more profound after hexamethonium, this might atone for any reduction of autonomic activity. Kay and Thorley (1951) suggest that it is the adynamogenesis produced by insulin which underlies its therapeutic effect. They further state that it is the aglycaemia following insulin administration which is responsible for the adynamogenesis. As indicated elsewhere, the combination of insulin with a syncope should lead to a very rapid depletion of carbohydrate, this being in other terminology tantamount to both an exaggerated aglycaemia and a more intense adynamogenesis with therefore an augmented therapeutic effect.

Sherwood (1952) injected pentamethonium iodide (a lower member than

hexamethonium of the series of polymethylene bistrimethylammonium salts) into the cerebral ventricles of patients in catatonic stupor. His rationale for doing this, was that schizophrenia might be a disease of the autonomic and vegetative centres and hence pentamethonium with its capacity for alteration of autonomic activity could be of therapeutic value. However, as it has been demonstrated that surgical techniques are associated with a systemic reaction, including a significant eosinopenia (Roche *et al.*, 1950) it would be unwise to exclude the factor of non-specific stress as contributory to the clinical improvement that occurred in these patients.

Wagner and Woods (1950) reproduced the motor component of catatonia with bulbocapnine, and discovered they could induce temporary remissions from this cataleptic state with environmental stress. Those patients in this series who were suffering from catatonic schizophrenia and who were treated with the combined stressors syncope and insulin, did manifest a greater degree of rapport immediately after the termination of hypoglycaemia than with insulin alone, but the improvement was invariably of brief duration. Thus, although increase of stress is followed by partial and even total eclipse of insulin resistance, it has no significant effect on the schizophrenic process.

SUMMARY

Drugs such as hexamethonium bromide, histamine and "Priscol" were used in an attempt to modify resistance to massive doses of insulin.

Hexamethonium bromide when administered to recumbent insulin resistant patients receiving Deep Insulin therapy, led to more profound levels of clinical hypoglycaemia than followed the injection of identical doses of insulin alone. However, the technique of inducing syncope with hexamethonium early in hypoglycaemia was even more successful in surmounting insulin resistance, being almost invariably followed on the same day by coma.

The hypoglycaemias modified with hexamethonium differed from conventional hypoglycaemias in that the customary prominent salivation and perspiration were much reduced. Comas tend to develop more rapidly after the combination of insulin with hexamethonium and it was noted that the deepest phase of hypoglycaemia was accompanied by widely dilated pupils in place of the pin-point pupils normally to be predicted. Termination of the modified hypoglycaemias must always be by the intravenous route as the stomach does not appear to absorb substances following large doses of hexamethonium. Although confusional states occasionally occurred after termination of coma when the two drugs had been combined, these were brief. It was feasible with this method of combined "insulin and syncope" to reduce the coma dose of insulin by between 10 and 30 per cent.

The fall of eosinophils after insulin and syncope was sometimes in excess and sometimes less than the eosinopenias recorded with control hypoglycaemias.

Histamine was of much less value in modifying insulin resistance, being only successful when its administration was succeeded by the eventual appearance of a Vaso-vagal circulatory pattern.

"Priscol" was of no value for modifying resistance to massive doses of insulin.

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"MEMORY FUNCTION" IN PSYCHIATRIC PATIENTS OVER SIXTY, THE ROLE OF MEMORY IN TESTS DISCRIMINATING BETWEEN "FUNCTIONAL" AND "ORGANIC" GROUPS

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THIS paper reports part of a research into the relationship of certain aspects of mental functioning and the psychiatric illnesses of old age. One of the apparent deficits of function to which much importance has been attached is "memory impairment". This is commonly considered part of various clinical syndromes, especially of the "organic" mental disorder of the senium. The measurement or estimation of memory function is, therefore, thought to be of considerable importance and most clinicians working with elderly patients use some kinds of tests which purport to measure it. There are, however, some points of conflict between clinical usage and the evidence of objective investigations in this area. It has never, for example, been demonstrated in relation to memory assessment that "memory" as such, can usefully be considered as even relatively independent of intelligence in young normal adult subjects (Eysenck and Halstead (1)).

In an earlier paper: Shapiro, Post, Lofving and Inglis (4) there was examined the discriminating power of certain objective test results as between "functional", "doubtful" and "organic" groups of elderly patients. These tests were designed to evaluate systematically some of the notions commonly held about the nature of mental dysfunctioning in elderly psychiatric patients. It was also intended that the results of these tests should help to decide the merits of the different views on memory function held by clinicians as compared with the views of those who would prefer to rely on more objective standardized test procedures. The tests selected fell into five main groups:

(a) *Clinical Sensorium Test* which comprises measures which attempt to systematize the formal unstandardized procedures which are part of the psychiatric investigation given routinely to patients in the Maudsley and Bethlem Royal Hospitals and which appear in most standard text-books of psychiatry. These items include such tasks as learning and remembering a name and address, reciting the months of the year backwards, the "Cowboy Story" and so on.

(b) *Clinical Questionnaire* which consists of measures which attempt to objectify the kind of observations the clinician uses when he makes a judgment of "memory impairment" in a patient. These measures are concerned, for example, with finding out what difference, if any, there might be between memory for recent and memory for remote events of both a personal and of a more general nature.

(c) *Memory Questionnaire*: This comprises items which attempt to make objective estimates of the kind of symptoms of "memory disorder" which would be likely to result in a relative taking the patient to see a doctor. The items

included observations as to whether the patient could find his way about the ward and the like.

(d) *Psychological Tests*: This group of tests was made up of the sort of tasks a psychologist might use or invent to examine the various aspects of mental functioning which he might subsume under the concept of memory (i.e. learning, retention and reproduction).

- (i) "Memory for first testing session", consists of such simple questions as, "How many days ago did I last see you?"
- (ii) The New Word Learning Test (Shapiro and Nelson (3)) concerned with the learning and retention of the definition of words presented orally.
- (iii) The Bender Gestalt Test which is a simple test of the ability to perceive visual patterns and reproduce them accurately. The test was slightly modified from the original and a simple recall version was also included.

(e) *Intelligence Test*: Four sub-tests of the Wechsler-Bellevue Adult Intelligence Scale Form I (Wechsler, 1944) (5) were given: these were the Vocabulary, Similarities, Picture Completion and Block Design sub-tests. They were given in order to see whether differences which might appear between the groups on "memory" items could be accounted for in terms of differences in intelligence as measured by the Wechsler.

The sample of patients tested numbered 102. These were both men and women who were admitted consecutively to the geriatric unit of the Bethlem Royal Hospital over a period of about one year. Their ages ranged from 60 to 92 with a mean age of 68·64.

The diagnostic criterion groups of patients, "functionals" (N=67), "organics" (N=18) and "doubtfuls" (N=17) were very carefully selected in order to avoid the dangers of criterion contamination (Shapiro *et al.*, op. cit.). A variety of the measures described did in fact differentiate significantly between the three groups of patients. The varying discriminating powers of the tests can be seen from the following table.

TABLE I

	Functionals		Doubtfuls		Organics		F	P
	M	SD	M	SD	M	SD		
Age	66·90	5·60	69·25	4·88	69·77	8·65	1·97	—
(a) <i>Clinical Sensorium</i> :								
Orientation	5·95	1·60	5·69	1·78	4·35	2·52	5·13	XX
Name and address	4·36	2·36	3·44	2·48	2·88	2·21	3·06	—
Logical Memory	7·25	3·82	7·34	4·37	6·15	4·78	0·53	—
Concentration	11·85	3·04	11·50	3·56	9·88	3·37	2·54	—
Arithmetic	2·72	1·45	2·75	1·44	2·12	1·93	1·09	—
Cowboy Story	3·39	2·28	3·09	2·33	2·91	2·71	0·31	—
Total: Clinical Sensorium ..	35·52	10·91	33·81	13·39	28·29	14·22	2·42	—
(b) <i>Clinical Questionnaire</i> :								
Memory for remote personal events	9·00	2·39	8·81	2·40	6·94	2·61	4·85	XX
Memory for recent personal events	7·31	2·16	7·31	2·58	5·77	3·25	2·77	—
Memory for recent general events	5·89	2·38	4·69	2·50	4·24	3·11	3·52	X
Total: Clinical Questionnaire ..	22·20	5·83	20·81	6·80	16·94	8·29	4·37	X
(c) <i>Memory Questionnaire</i> :								
Memory for time and routine ..	15·07	3·45	13·75	3·86	12·00	5·30	4·28	X
Memory for people on ward ..	10·92	6·85	8·88	7·01	6·59	7·58	2·70	—
Orientation on ward	12·21	2·71	11·93	3·15	9·24	4·24	6·22	XX
Total: Memory Questionnaire ..	38·20	11·03	34·56	12·46	27·82	15·15	4·98	XX
(d) <i>Psychological Tests</i> :								
Memory for 1st test session ..	8·68	2·88	8·16	3·35	6·50	3·21	3·47	X
Learning (NWLRT)	19·44	12·12	25·66	15·35	27·47	16·43	3·06	—
Retention Ia	8·43	2·20	8·63	3·92	7·40	1·74	1·33	—
Retention Ib	3·80	1·18	3·25	1·61	3·00	1·51	3·01	—
Retention IIa	6·67	2·62	6·38	4·29	4·82	3·11	2·47	—
Retention IIb	3·13	1·31	2·66	1·97	2·12	1·66	3·26	X
Bender Copy	19·43	3·40	19·38	4·02	15·24	4·47	8·82	XXX
Bender Recall	10·30	5·08	9·38	6·00	6·35	4·09	3·99	X

(e) *Intelligence Tests:*

Vocabulary	9.62	3.26	10.19	3.82	8.71	3.69	0.80	—
Similarities	6.54	3.57	6.13	2.71	4.88	3.41	1.57	—
Picture Completion	7.61	4.15	8.44	3.48	5.88	4.81	1.69	—
Block Design	5.33	2.59	5.94	2.27	3.94	3.11	2.62	—
Total: Subtests	72.75	30.82	76.72	23.50	58.53	30.40	1.90	—
(Pro-rated)								

Key—Levels of significance: X = .05; XX = .01; XXX = .001.

Two of the main findings shown by these results are to be examined in this paper, they are:

(a) The fact that significant differences appear between the psychiatric groups on some tests which seem to involve "memory function". These differences are not accountable in terms of differences in intelligence, since the intelligence tests (see Table I) did not themselves discriminate between the criterion groups. It is therefore necessary to discover whether such discriminating tests define a common function different from that measured by the intelligence tests, or whether their discriminating power is due to some functions specific to each test separately.

(b) The fact that the best discrimination between the criterion groups is achieved by a measure of the accuracy of drawing copies of some of the Bender Gestalt test figures. The recall form of the test also discriminates between the groups although not at such a high level of confidence. It is hence necessary to discover something about the relationship between this test and the other discriminating tests which, in terms of their content, appear to involve more obviously some sort of "memory function".

METHOD

The first problem is to see whether the discriminating tests which seem to involve "memory function" have on the one hand some function in common or if, on the other hand, their discriminating power could be due to something specific to each test. Product moment correlations were run between selected items which gave good discrimination between the groups (i.e. Items 9, 11, 13 and 15, Table I above), the two parts of the Bender Gestalt test (Items 23 and 24, Table I) and the pro-rated total Wechsler (Item 29, Table I) for the functional and organic groups. In this further examination the results of the "doubtful" group were not considered since it did not seem that such analysis would be worth the time which would be required to perform the necessary computations.

The two resulting matrices of intercorrelations are shown in Table II.

If the functions measured by the intelligence test were accounting for all the variance held in common between the discriminating tests (i.e. if the actual *discriminating* parts of the variance were specific to each test) then partialling the intelligence measure results out of the matrices would be expected to reduce the partial intercorrelations of these remaining tests to zero. That is to say, the result of partialling should be to make the mean of the intercorrelations in the first order partialled matrices approximate to zero.

The pro-rated Wechsler total was partialled out from the matrices shown in Table II by the method described by McNemar (2). The remaining matrices of intercorrelations are shown in Table III.

After partialling out the pro-rated Wechsler total it is found that the remaining intercorrelations have a mean of +.19 and +.38 for the functional

TABLE II

Intercorrelations Between Selected Discriminating Sub-tests, the Two Parts of the Bender Gestalt Test and the Pro-rated Wechsler Total

Functionals (N=61)*													
Bender Copy	Bender Recall	Pro-rated Wechsler	Memory for Remote Personal Events	Memory for Recent General Events	Memory for Time and Routine	Orientation on Ward	Bender Copy	Bender Recall	Pro-rated Wechsler	Memory for Remote Personal Events	Memory for Recent General Events	Memory for Time and Routine	Orientation on Ward
1	2	3	4	5	6	7	1	2	3	4	5	6	7
1													
2	x	.79	.50	.47	.65	.64	x	.78	.80	.73	.71	.55	.73
3		.69	.38	.35	.57	.52		x	.87	.80	.73	.67	.73
4		x	.57	.57	.56	.69			x	.78	.80	.54	.70
5			x	.65	.52	.53				x	.83	.66	.74
6				x	.44	.50					x	.61	.78
7					x	.52						x	.70
						x							x

Organics (N=17)*													
Bender Copy	Bender Recall	Pro-rated Wechsler	Memory for Remote Personal Events	Memory for Recent General Events	Memory for Time and Routine	Orientation on Ward	Bender Copy	Bender Recall	Pro-rated Wechsler	Memory for Remote Personal Events	Memory for Recent General Events	Memory for Time and Routine	Orientation on Ward
1	2	3	4	5	6	7	1	2	3	4	5	6	7
1													
2	x	.79	.50	.47	.65	.64	x	.78	.80	.73	.71	.55	.73
3		.69	.38	.35	.57	.52		x	.87	.80	.73	.67	.73
4		x	.57	.57	.56	.69			x	.78	.80	.54	.70
5			x	.65	.52	.53				x	.83	.66	.74
6				x	.44	.50					x	.61	.78
7					x	.52						x	.70
						x							x

* The number of patients in each group differs slightly from the number mentioned on page 590 above. Individuals who failed to complete all the test items were excluded from the groups in order to facilitate the computations.

TABLE III

Intercorrelations Between Selected Discriminating Tests and the Two Parts of the Bender Gestalt with the Pro-rated Wechsler Total Partialled Out

Functionals (N=61)												
	Bender Copy	Bender Recall	Memory for Remote Personal Events	Memory for Recent General Events	Memory for Time and Routine	Orientation on Ward	Bender Copy	Bender Recall	Memory for Remote Personal Events	Memory for Recent General Events	Memory for Time and Routine	Orientation on Ward
	1	2	3	4	5	6	1	2	3	4	5	6
1												
2	x	.19	.10	.04	.41	.21	x	.29	.28	.45	.23	.40
3		x	— .02	— .07	.31	.08		x	.39	.12	.48	.34
4			x	.49	.30	.23			x	.55	.45	.43
5				x	.18	.18				x	.35	.40
6					x	.22					x	.54
						x						x

and organic groups respectively. If the standard error of a mean correlation of zero in a first order, partial correlation matrix is regarded as $\frac{1/\sqrt{n_i-3}}{\sqrt{n_c}}$,* where n_i is the number of individuals in the criterion group and n_c is half the number of correlations in the complete matrix, then both the observed mean correlations are significantly different from a mean of zero at well beyond the 1 per cent. level of confidence (C.R.'s are 5.60 and 5.44 for the functionals and organics respectively).

It is therefore possible to say that the selected discriminating tests may have some function in common with each other which is different from the function they hold in common with the intelligence test.

It is also required to discover what the relationship may be between the Bender Gestalt test, that is, the test which discriminates *best* between the criterion groups and the other discriminating tests which as shown above have some function in common. It remains in fact to be seen whether the discriminating tests hold their common variance in common also with the test which discriminates best between the criterion groups.

In order to see whether the function underlying the Copying item of the Bender Gestalt could explain the remaining positive intercorrelations (and so the remaining common variance between the discriminating tests) the variable "Bender Copy" was partialled out from the first order matrix (Table III), from which the result of the intelligence test had already been partialled. The resulting second order matrix is shown in Table IV.

It can be seen from Table IV that this step reduces the common variance by very little. The mean intercorrelations now become +.17 and +.33 for the functional and organic groups respectively. The standard error of a mean correlation of zero in a second order, partial correlation matrix may be estimated by the formula $\frac{1/\sqrt{n_i-4}}{\sqrt{n_c}}$. Both the obtained mean correlations are found to be significantly different from a zero mean at beyond the 1 per cent. level of confidence (C.R.'s 4.06 and 3.76 for the functional and organic groups respectively).

It follows that the function underlying the Bender Copy item cannot account completely for the common variance remaining after the result of the intelligence test has been held constant. This can be shown, in the same way, to be true of the Bender Recall item.

It is now, therefore, possible to say that the selected discriminating tests appear to have something in common which is neither accounted for by the intelligence test nor by the test which discriminates best out of the whole battery, the Bender Gestalt.

An interesting consequence of these findings is that they reveal a discrepancy with some previous studies of "memory tests". For example, Eysenck and Halstead (1) after a study of some clinical "memory" tests concluded that the ability involved in these tests was not identifiably different from that involved in the intelligence test which they also administered. They therefore

* The authors are indebted to Dr. R. W. Payne for this statistic. He notes, however, that this group of correlation coefficients was obtained from the *same* sample tested on the same occasion. Hence the "degrees of freedom" involved in the formula are not truly independent. Such a test of significance thus errs in being too stringent; it is possible to reject the null hypothesis (that this is a matrix of "chance correlations") unjustifiably. In other words it would be necessary to take different samples of persons for each for this test of significance to be strictly applicable. Subsequent analysis of the matrix should therefore be treated with considerable caution.

considered it misleading to talk about scores on the various tests as estimates of "memory ability" since the tests were in fact measures of intelligence. The results of the present study, on the other hand, seem to offer evidence for the existence of some function that might be called "memory".

Various hypotheses could be put forward to account for this discrepancy. In the first place the ages of the groups of subjects were different; in the Eysenck and Halstead study the subjects were young soldiers. In the second place the tests of memory in the present study which have already been examined were somewhat different from those used in the earlier work, also a different test of intelligence was employed and different techniques of statistical analysis were employed.

It was decided to test the hypothesis that the difference in the results was due to differences in the tests on other data from this present investigation. This was possible since some of the items of the "Clinical Sensorium" group were similar to those used in the Eysenck and Halstead study.

The same rationale was adopted as was used above for the analysis of the functions underlying the discriminating tests. First the items of the Clinical Sensorium group were intercorrelated with the pro-rated Wechsler total for both the functional and organic criterion groups. The resulting matrices are shown in Table V.

It was then reasoned that if the function underlying the intelligence test results were accounting for all the common variance, then partialling out the pro-rated Wechsler total should leave matrices of correlations the means of which should not differ significantly from a mean of zero.

The pro-rated Wechsler total was therefore partialled out resulting in the first order matrices shown in Table VI.

The mean correlations for the two resulting matrices were $+0.21$ for the functional group and $+0.18$ for the organic group. Once again taking the standard error of a mean correlation of zero in a first order matrix to be $\frac{1/\sqrt{n_i-3}}{\sqrt{n_c}}$, then both these found mean correlations are shown to be significantly different from zero at beyond the 1 per cent. level of confidence (C.R.'s 6.20 and 2.61 for functionals and organics respectively).

Thus, the Clinical Sensorium group of items, with the intelligence function held constant still have some function in common which might be called "memory".

The hypothesis, therefore, that the discrepancy between the present findings and those of the Eysenck and Halstead study is due mainly to a difference in the test items used is not confirmed. For the purpose of the present study, however, it does not seem profitable to pursue this discrepancy and it is sufficient to note that it remains to be explained.*

DISCUSSION

The correlational study of certain tests which have been shown to discriminate to a statistically significant degree between functional and organic groups of elderly psychiatric patients shows that these tests have some of their variance in common which is not held in common with a test of intelligence. This outcome is consistent with the hypothesis that these tests measure some

* It should also be noted that in partialling out the pro-rated Wechsler total it may be that some of the common variance left to the first order partial intercorrelation matrix might conceivably be due to some remaining factor such as spatial ability. This notion also remains untested.

TABLE V
Intercorrelations Between the Items of the "Clinical Sensorium" and the Pro-rated Wechsler Total

	Functionals (N=61)							Organics (N=17)						
	Orienta- tion 1	Name and Address 2	Logical Memory 3	Concen- tration 4	Arith- metic 5	Cowboy Story 6	Pro-rated Wechsler 7	Orienta- tion 1	Name and Address 2	Logical Memory 3	Concen- tration 4	Arith- metic 5	Cowboy Story 6	Pro-rated Wechsler 7
1	x													
2		.54				.65	.69	x	.73	.71	.61	.73	.41	.83
3		x	.52	.47	.49	.39	.49		x	.74	.54	.60	.31	.75
4			.43	.33	.36	.64	.59			x	.52	.70	.57	.76
5			x	x	.57	.48	.68				x	.75	.31	.67
6					x	.59	.61					x	.46	.84
7						x	.47						x	.47
							x							x

TABLE VI
Intercorrelations Between the Items of the "Clinical Sensorium" with the Pro-rated Wechsler Total Partialled Out

	Functionals (N = 61)						Organics (N = 17)					
	Orienta- tion 1	Name and Address 2	Logical Memory 3	Concen- tration 4	Arith- metic 5	Cowboy Story 6	Orienta- tion 1	Name and Address 2	Logical Memory 3	Concen- tration 4	Arith- metic 5	Cowboy Story 6
1	x						x					
2		x						x				
3			x						x			
4				x						x		
5					x						x	
6						x						x

common function which might, in view of the content of the items which measure it, be tentatively labelled "memory". A similar result has been shown for certain tests which fail to discriminate between the criterion groups. It may be said, therefore, that this study has produced confirmatory evidence for the existence of a measurable function which could be called "memory", independent of intelligence. The various psychological relationships (e.g. learning, retention and reproduction or recognition) which may underly this function have not yet been teased out for the groups dealt with in this study.

Although some of the tests which involve this "memory function" provide significant differences in mean score between the criterion groups the actual overlap of group scores is so large as to make the tests virtually useless for differential diagnosis in any individual case. The discrimination afforded by these tests is certainly not as good as would be expected if "memory dysfunction" were one of the leading features of early cerebral involvement in old age.

In patients with a fully established dementia memory defect is, of course, one of the more frequently described disturbances of mental function. However, at this late stage of illness it is impossible to discern loss of memory in isolation; the defect may, in fact, merely be part of the general intellectual decline. Although an analysis of mental functioning in advanced dementia, and a study of its relationships to various types of brain changes, would no doubt be of considerable interest it is unlikely that the clinician would require the assistance of the psychologist in the diagnosis of this degree of dementia. None of the patients in this study, who had all been able to achieve some degree of success in most of the tests given, were severely demented. In most of the cases the help of the clinical psychologist would have been welcomed either to exclude or confirm the presence of "organic" mental changes.

CONCLUSIONS

Two main conclusions may be drawn from the results:

(a) So far as the problem of differential diagnosis between functional and organic groups of elderly patients is concerned the attempt to use "memory function" as part of the criterion is not particularly useful. If this diagnostic question is thought to be important then it would be much more profitable to develop and refine, for example, the Bender Gestalt test.

(b) There is evidence for something which might be called "memory function" in elderly psychiatric patients. It is possible that a continuum of memory efficiency could be constructed which would cut across the "functional-organic" dichotomy. This might explain why the expected differences were not found in this study although it is a matter of common observation that many old people suffer from "failing memory". It is suggested that the nature of such a function must be considered as a problem to be tackled in its own right, divorced from "diagnostic" considerations.

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PAST AND PRESENT TRENDS IN CHILD PSYCHIATRY*

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WHILE to no one can the present state of child psychiatry afford grounds for complacency, there is at this time an awareness of shortcomings, a lively sense of self-criticism and an urgency for advance in one direction or another that does give some grounds for optimism. I have thought it profitable at the present time to attempt to survey the scene.

Looking to the past, one should always start with a reference to antiquity or a classical allusion but I think a passing reference to the situation of sibling rivalry obtaining between Cain and Abel in the fourth chapter of Genesis will be sufficient. It does, however, give rise to the interesting inference that Eve our first mother had, as a mother, certain inadequacies.

It is very difficult to get a clear historical perspective. This depends, like most perspectives, on where the observer is standing.

Perhaps the three disciplines involved can best be studied in retrospect; the psychological-pedagogic; the medical-paediatric-psychiatric; the sociological, with its present representative the psychiatric social worker. Even this division is not without difficulties as the exponents of the three have materially changed their functions in the short history of child psychiatry.

If we look at the last hundred years, the psychological-pedagogic emerges prominently. The history of psychological development in this field has recently been presented by Gertrude Keir and others (1) and the following observations have been culled from this work.

It is almost a hundred years since, based on the evolutionary school of Darwin, psychological studies came to be made of the child. Galton, in an anthropometric laboratory established at University College, made studies and measurements of children at the request of parents and teachers—"to learn their powers" or to "obtain timely warning of remediable faults in their development". Similar laboratories were advocated.

Universal education in 1876 raised urgently the question of varying intellectual capacity. Sully, Professor of Mind and Logic in London University, in 1894 established an education centre in his department with a laboratory to which children were brought for study and demonstration to students and teachers. A number of surveys were later made to assess norms. The British Child Study Association was set up in 1893 for the study of individual children by psychological, sociological and anthropometric methods. Centres were set up in cities outside London. In 1907 Burt became lecturer in psychology at Liverpool. In 1913 he was appointed by the L.C.C. as psychologist—to advise on individual problem children referred, assist in allocating children and make surveys of the school population. Educational, social data and medical information was taken into account. In France a similar Child Study Group preceded the emergence of the tests of intelligence by Binet.

* Chairman's Address delivered to the Child Psychiatry Section of the Royal Medico-Psychological Association on Thursday, 10 November, 1955.

It is of interest to note here that the psychologists were in line with the biological approach and their scope might have been defined by Sully in the 1870's who spoke of psychology as being concerned with "observations within the normal" as opposed to "deviations from the normal" which were by him regarded as medical—and at that time limited to the organic. It is a matter of considerable interest to see how psychiatric acceptance of emotional causality and psychopathology and the Meyerian socio-psychological approach on the one hand, and on the other hand the pre-eminence of the psychological contribution in cognitive testing and the inevitable limitation in integrating the somatic in illness, of the non-medical have combined to reverse the balance. The somewhat attenuated concept of "maladjustment" in the educational field continues however to reflect the biological approach but is limited to "the psyche in society".

In America Cattell, who had studied in Galton's anthropometric laboratory, held in Pennsylvania in the 'nineties the first chair in psychology. In 1896 he established a psychological clinic calling for psychological, social, educational and medical information.

Such is the psychological background to child guidance, and it is worth realizing how psychological that background is when we trace the development of the Child Guidance movement.

I will speak at less length on psychiatric development because the story is so familiar. Medicine in the second half of the nineteenth century was advancing strongly in the somatic field—and before we dismiss this we should appreciate the importance of the advance in physical health to psychiatrists. Psychiatry had first defined some of the organic deteriorations in children as in adults. Kraepelin made his further diagnostic classifications of the functional psychoses. In this way, psychiatry proceeded and developed, and the first child psychiatry was its application where possible to children. Its roots lay in the psychiatry of adult life or the somatic data of defect, or derived from observed neuropathology to neuropathology postulated. That this approach is still operative and in its proper proportion still in the ascendant is apparent in the contributions of electroencephalography and in certain aspects of cerebral surgery today.

But with the work of Charcot, Janet and Freud and the analysts, new forces came into being in psychiatry. Already with Homburger attention was being given to psychological or emotional and familial factors.

Meyer from Switzerland, again via England and Scotland, was developing his socio-psycho-biology—the integration of somatic, emotional, intellectual in the individual seen not only in his environment, but in the light of his biological development.

The work of Healy falls into place here, biological in his approach, a follower of Meyer but also having worked with Cattell, his studies first in delinquency led to appreciation of the same factors in neurosis.

The Mental Hygiene Movement in the U.S.A., initiated by Clifford Beers' book and sponsored by Meyer and others, played an important role and the Judge Baker Clinic in Boston set the pattern for the Child Guidance Movement; Healy the psychiatrist with Bronner the psychologist—and the psychiatric social workers—their origin in the Phipps and the Boston Psychopathic Hospital.

It is important to see what the actual child guidance investigation involved—the medical and psychiatric assessment of the child; the family and social setting; the psychological assessment of the child's capacities and the educational

setting; the biographical study. The comprehensiveness of the approach put child guidance in the unique position of being from its origins social medicine. It cut a new and wide swathe too well known to be dilated on here but its unique contribution was the concept of the child, reactive to his setting. It should be appreciated that in the parent-child relationship, child guidance recognized the dynamics that have appeared again in the group psychotherapy of the past two decades.

Again the history of the development of the Child Guidance Movement in England in the late twenties and thirties is, I think, better known to some of my audience than to me. It is indisputable however, I think that it was engrafted on the basis established by English psychology.

Established the movement was and in the field of psychiatry and medicine, but it is to be remembered that the active movement in the twenties was that of medical psychology. Medical psychology was the study of the emotional life in relation to symptoms psychic and somatic, less concerned with the organic causality and psychotic manifestation. It is with us again in psychosomatic medicine.

In the objectives of the Child Guidance Council, it is of interest too to see in the first report in 1922 the headings (1) to develop the psychiatric study and treatment of difficult children; (2) to develop the work of the visiting teacher in connection with this study; (3) to expand the work by educational methods. The last element is still alive and active though directed to professional medical disciplines, as in the L.C.C. in the past year or two.

With a new movement and with its background it is perhaps not surprising that both in the United States and here the effort to sustain and emphasize the new elements led to a certain rigidity of pattern, and in this pattern we find the initial comprehensiveness subordinated to emphasis on the intra-familial stresses and the educational situation as the two aspects with which Child Guidance was particularly fitted to deal. Propagation by grafts from the original stock rather than by cross-fertilization increased this tendency. Two associated disciplines not rooted in the ethic of medicine perhaps contributed. Child guidance in pursuit of new knowledge, can be accused of treading too narrowly between its *research function*, while avoiding the exacting requirements of research—and its *clinical function*, while avoiding full responsibility for the population of children handicapped and otherwise. Circumstances seemed to justify this limitation. Better to deal with those susceptible to its techniques than lose itself in the morass of children wanting help. But Child Guidance came to risk becoming too restricted in its application, limited by concentration to the area in which it was successful.

Treatment too, with its new vast contribution from psychopathology—with the psychoanalysis of children, the new play techniques from Anna Freud and Melanie Klein, reinforced this focussing.

The psychologist left to deal with the children found the relationship situation; play therapists appeared, were analysed and became lay child therapists. The psychiatric social worker, left to talk with the mother—found the relationship too, got herself analysed, and not infrequently (in the U.S.) turned into a lay psychotherapist. Perhaps it is not unfair to suggest that often the psychiatrist, in a minority of one to two and apologetic for the somatic sins of his forebears, had a belated analysis—and became a lay psychotherapist too.

Be that as it may, we find such a writer as Levy in his *Maternal Overprotection* (2) lamenting the loss of the initial width and inclusiveness of Child Guidance.

Again sprung from the loins of Adolf Meyer we find a restatement of the original socio-psycho-biological position in the work of Kanner at Johns Hopkins in the thirties. Here we have the children's psychiatric clinic established in the heart of the paediatric department; children referred from paediatric investigation for psychiatric assessment, for social investigation and for psychological testing.

From this clinic derive such figures as Shirley and Langford operating in paediatric hospitals and concerned with the education of paediatricians. I will, perhaps, be pardoned for pointing out that from this unit comes much that is embodied in the organization of the Children's Department at the Maudsley.

Perhaps it is at this point we should recapitulate too the position of the good practitioner and paediatrician who practise with humanity and sympathy. Often they are implicitly aware of many of the factors operating, though it is we can make them explicit. I know of no better description of maternal attitudes in relation to somatic illness than the chapter of Cameron's *Nervous Child* written in the 1920's.

Time hardly permits an assessment of the pedagogue. How much has the teacher at the head of the school for maladjusted to contribute? How strike the balance between clinical awareness of the individual and the creation of the social forces that stimulate and mould to conformity? How much has the contribution of Adler in terms of seeing final causes in the strivings of the child as opposed to affective causes for immediate behaviour problems, and the socializing forces of the social group contributed to progressive education and been absorbed at second hand by child psychiatrists? We have here another tributary to the broad stream of child psychiatry.

With the 1940's we have the war, the evacuation of children and the full impact of disturbance on the professional bodies concerned. In the post-war period the new legislation has placed squarely on child psychiatry responsibility for the great population of handicapped, sick and disturbed children. This responsibility, though hardly appreciated, has done much to contribute to the present vigour and challenge of child psychiatry. What of the disturbed, defective and backward, the post-encephalitic, the cerebral dysrhythmias, the gross situations of family stress, the psychotics, the adolescents with their mingling of the child and the adult in the syndromes and situations presenting? While the specialized clinic has its role still, we have forty years behind us of experience and knowledge—and our knowledge, derived from psychopathology and the understanding of inter-personal relationships, can be deployed in many areas, where these are not the only factors, or means of therapy. Much that is obvious and has been forgotten must be restated. Our responsibility is no longer *only* for the child of average or superior intelligence with co-operative parents and a problem of intra-familial stress or education. How must knowledge and time be deployed not only to give space for the intensive treatment of the few but also for the extensive treatment of the many? Such are the questions of today.

In spite of differences, we find ourselves more united than ever before. No longer do the analysed and the psychopathologically oriented have to justify and defend. Their theoretical knowledge is common ground, in child psychiatry—and much available directly to the psychiatrist who will but observe—it is literally child's play. No longer does a concern with cerebral lesions inhibit awareness of family stresses and interpersonal relationships. Two main areas of emphasis still exist, but the difference does not lie between the psychological and the somatic—between those concerned with the mind

and the body. In the psychopathological approach in child psychiatry, we have those who see in the emotional life, in interpersonal relations, the personality the chief concern of the psychiatrist; in psychotherapy his chief weapon. This school emphasizes the ground common to the other disciplines in child psychiatry. In the other school, in the psycho-biological approach, we find those who see as the subject of child psychiatry the whole individual in all his aspects of body and mind and in their therapy employ every method, including the psychotherapeutic, that will modify stress of body or mind. Equally appreciative of the greatly widened effectiveness that has come from the associated disciplines, this school emphasizes the continuity of child psychiatry with adult psychiatry, general medicine and paediatrics. These approaches are not mutually exclusive. Let us not see them in opposition. But in our appreciation of the emotional and the psychopathological, let us not continue to fight a battle that has been won long ago. Finally let us *not* create among the sick an élite of those who will respond to our favoured techniques. Our duty is to every child and family who need our help; to the dull and disturbed as much as to the intelligent and neurotic.

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THE USE OF LITHIUM SALTS IN THE TREATMENT OF MANIC STATES

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INTRODUCTION

It is often said that the Disorders of Affect are the most commonly encountered psychoses and it is, of course, depressive illness which accounts for the large majority of such disorders; nevertheless Mania and Hypomania present as great a problem. As great because from the medical point of view treatment is less certain and less satisfactory, and socially because the manic, and even more the hypomaniac, patient seems capable of doing more harm to his family and home by his ill-judged actions and schemes than almost any other person. He seems, too, to have a singular affinity and attraction for wasters, ne'er-do-wells and psychopaths who assist all too readily in the disposal of goods and money and encourage him in his grandiose and extravagant schemes.

For depressive illness we have, in Electro-Convulsant Therapy, a ready, useful and comparatively reliable, safe and effective therapeutic measure. The majority of patients accept such treatment quite readily and respond well to it. Where there is a history of chronic or recurrent illness, leucotomy (often in one of its modified forms) seems to offer a good hope with an excellent prognosis. Depressed patients, moreover, from the very nature of their illness, tend to accept treatment, even if they dislike it, often maybe from poorly concealed masochistic urges and as punishment for what they believe to be their guilt and unworthiness.

Manic and hypomaniac patients, on the other hand, present a totally different problem. Firstly they rarely, if ever, complain themselves and consequently they resent being referred to the doctor. When they do come it is often unwillingly or merely to demonstrate their well-being; or maybe to show some invention, gadget or discovery they believe they have made. Secondly, such patients, even when they have been seen, are notoriously unreliable over treatment and will rarely accept it. In the majority of patients it is only when under some form of control (which for all practical purposes means certification) that treatment can be carried out satisfactorily.

In Mania (and Hypomania) as in depression, convulsion therapy—usually E.C.T.—proves satisfactory in many instances, but the problem of long-term prognosis is not affected and in the case of recurrent manic attacks leucotomy seems to have no benefits to offer and is in fact often liable to make things worse. Any effective method of treatment is therefore to be welcomed, and more especially so if there is any suggestion that it can be continued after the patient leaves hospital, on a maintenance or prophylactic basis.

MATERIAL AND SCOPE OF WORK

My attention was drawn in 1952 to the paper by Noack and Trautner (1) which had appeared the previous year, reporting the use of Lithium in the treatment of Maniacal Psychosis and since their findings appeared to substantiate

other claims, notably those of Cade (2) and Ashburner (3), it was resolved to try the use of Lithium in a few manic patients who for one reason or another presented especial difficulty. These difficulties were mainly the refusal of the patient or his relatives to allow physical methods of treatment.

Following the most encouraging effects in the first two patients, the use of the drug was extended, but it has continued to be prescribed on clinical grounds and in an empirical way and without controlled experiment such as is reported by Schou and others (4).

The drug is now being rather more widely used, and as a result of experience gained some errors are now being avoided, but cases are only reported here who were treated in the first three years and who have been followed up, up to 30 September, 1955. For those patients in hospital the position has been reviewed, whilst for those now left, follow-up interview has been carried out where possible or failing this an enquiry has been sent to the last known address and the results recorded from the information so gained. The first fifty-eight patients are included in the analysis of results—all were patients in this hospital and the same criteria of assessment have been used throughout. All the male patients were under my direct clinical charge. This has meant that the regulation of dosage and prescription has been very much easier than in the female patients—a more random selection and with no single person to direct treatment. I have, however, been personally responsible for all the assessments.

DIAGNOSTIC CATEGORIES

For descriptive purposes patients have been divided into five groups according to the nature of the psychosis:

(1) *Mania and Hypomania*—where there has been no history of any depressive attacks.

(2) *Manic-depressive Psychosis*—the history here including both manic and depressive attacks.

(3) *Mixed Psychoses—Schizo-Affective States*. Here many features characteristic of both types of illness have been in evidence simultaneously. Such patients have almost invariably been presented at Staff Clinical Conferences and opinions have differed as to the true nature of the underlying condition.

(4) *Schizophrenia, with affective overlay*. Here the basic condition has undoubtedly been schizophrenic but there has been preserved a strong affective overlay and response.

(5) *Schizophrenia*. This has been a small group, mainly women, where because of noisiness and behaviour disturbance a trial was thought to be worthwhile.

TABLE I
Number of Patients in Diagnostic Categories

Group	Male	Female	Total
1	9	11	20
2	12	5	17
3	2	3	5
4	2	2	4
5	2	10	12
Total	27	31	58

EFFECTS

Findings of effects (summarized in table form below) have been substantially in agreement with those reported by others. Excitement and over-activity have been greatly improved and no actual depression has been noticed, nor has a depressive episode been precipitated in any established cyclothymic condition.

TABLE II
Results in 58 Patients, Following Treatment

Group	Male				Female			
	No. of Patients	Re-covered	Im-proved	No Change	No. of Patients	Re-covered	Im-proved	No Change
1 ..	9	5	4	—	11	2	7	2
2 ..	12	6	5	1	5	1	4	—
3 ..	2	1	1	—	3	—	2	1
4 ..	2	1	1	—	2	—	1	1
5 ..	2	—	1	1	10	—	2	8
	27	13	12	2	31	3	16	12

Any patient who was not significantly improved is included under the heading of "No change". No patient was found to have been made worse. In addition to clinical assessment the ward staff's reports on the patients' behaviour and progress and the Sister or Charge Nurse's opinion were used in deciding in which category a patient should be placed.

Two features stand out in the above table. Firstly the greater proportion of the men who did well, particularly the number (almost 50 per cent.) classified as recovered. The explanation is, I believe, simple and has already been indicated—namely that all were under single direct clinical control. Doses were in consequence uniform, or at least all to a pattern, and were higher. Also in the main patients with affective disorders were chosen for treatment. The second point is the impressive result obtained in the affective or predominantly affective groups—male and female. Thus of 23 male patients with affective or mixed schizo-affective illnesses, no fewer than 22 recovered or were greatly improved, and of the 19 female patients in these categories 16 were improved or recovered. In addition, one manic patient improved initially, though subsequently relapsing and in consequence is shown as having made no change.

The criteria for improvement within the hospital have mainly been those of conduct or in relation to the need for other forms of treatment, for management purposes. Thus in one of the two schizophrenic male patients where there was a previous history of recurrent catatonic episodes every 4–6 weeks, necessitating treatment with E.C.T., no such episodes have occurred in six weeks up to the end of September, 1955, and no E.C.T. has been needed. (This improvement has continued up to April without any relapse.) The patients too have been able to remain in open wards and to enjoy extensive privileges in the hospital.

DRUG AND DOSAGE

Except in the first two cases, in which Lithium Citrate was used initially, Lithium Carbonate has been used in every case. The pharmacist has supplied capsules containing the powder, these capsules being swallowed whole. No

TABLE III
Disposal of Patients

Groups	Male			Female		
	Patients	Dis- charged	In Hospital	Patients	Dis- charged	In Hospital
1	9	6	3—all improved	11	7	4—3 showed marked improvement
2	12	7	5—4 improved	5	3	2—both improved
3	2	2	—	3	2	1—improved
4	2	2	—	2	1	1—no change
5	2	—	2—1 markedly improved	10	1	9
	—	—	—	—	—	—
	27	17	10	31	14	17
	—	—	—	—	—	—

This number includes one patient admitted under Urgency Order who improved whilst receiving the drug but who left the hospital on the expiration of the Urgency Order. He refused to take any more capsules and has subsequently developed a florid manic state. This patient, a well-established manic-depressive, had begun treatment whilst an out-patient prior to admission, but had refused to continue as he said he was so very well and was not in need of any drugs.

other vehicle has been used and no other substances have been added. Dosage has varied, the highest being 0.6 gm. four times a day (one male patient) and the lowest 0.2 gm. twice daily (several female patients). In the majority of patients, and certainly in almost all who have shown improvement, dosage has been Lithium Carbonate 0.6 gm. three or four times daily for the first 7–10 days, subsequently the dosage being reduced to twice daily and later (after a month or so of improvement) to a maintenance dose of 0.6 gm. daily. This has been continued for weeks or months; sometimes after patients have left the hospital. With other patients the drug has been left off after several weeks. Patients have done well with both regimes and no untoward results have occurred. In a number of female patients the maintenance dose has been 0.3 gm.

In every case the drug has been given on six days in the week and omitted on one day. This method, suggested by the Australian writers (1 and 2) allows of complete elimination. To preserve uniformity, for administrative ease and to simplify dispensing instructions, Sunday was selected for the rest day regardless of which day treatment was commenced.

Patients have throughout remained on ordinary diet without any restrictions. They have had the normal amount of salt both in cooking and as salt added at the table.

TOXIC EFFECTS

Toxic effects presumably attributable to Lithium have been observed in 12 patients (4 men, 8 women). The four male patients each showed slight unsteadiness of gait, with nausea and drowsiness as additional symptoms in one man.

Of the female patients two reported vomiting, although it was by no means clear in one patient that this could be directly attributed to the Lithium. One patient had some drowsiness, one mild ataxia, one giddiness, and one feelings of trembling and buzzing in the ears. One patient became rather pale and one complained of nausea and pains in the abdomen. This latter patient, although having symptoms with her initial dosage of 0.6 gm. t.d.s., lost them when the

drug was restarted, even though the same dosage was used again. On one occasion this patient collapsed but I do not think that this can be attributed to the Lithium since a similar collapse occurred later, some week after Lithium had been discontinued.

All toxic symptoms rapidly disappeared when Lithium was withheld, and in each case a return to the drug was without toxic effects.

DISCUSSION

Use and Action. Lithium has been used in medicine for many years. We find Garrod (5) writing nearly a hundred years ago—in 1859—of Lithium Carbonate: “When given in doses of 1–4 grains in water two or three times a day it has no injurious effects.” He was describing the treatment of gout and similar conditions and Lithium was still being recommended in such conditions in the time of World War I (Daniels (6)). It is only very recently that we find it described as positively useful in psychiatric practice.

Bennett (1947) (7) lists Lithium amongst items in medical therapy “popular until recently” but it was not until 1949 that Cade’s article (2) really suggested positive use and even since then there have been relatively few reports. In the following year, 1950, Talbott (8), reviewed the use of Lithium as a substitute for Sodium Chloride in the production of a low salt, or salt-free diet and also in the treatment of gouty arthritis as recommended by Daniels (6).

As so often in medicine the original decision, by Cade (2) to use Lithium in the treatment of psychiatric conditions of excitement, seems to have followed a chance and almost accidental observation. Cade tried Lithium in the treatment of mania and in behaviour disorders associated with epilepsy and put forward the suggestion that the benefit said to be derived from certain well waters could be due to the Lithium present therein.

Lithium salts have been widely used as a substitute for Sodium Chloride, especially in hypertensive patients and those with cardiac disease, as well as in gout, rheumatism and allied conditions. Besides the Australian writers (1, 2 and 3) others reporting favourably on its use in psychiatric disorders include Reyss-Brion and Grambert (9) from France, and the Danish writers Schou, Joel-Nielsen, Stromgren and Voldby (4).

Toxic Effects. Talbott (8) in his review found no rise in uric acid excretion after some months, but using Lithium as a salt substitute there was considerable daily excretion and occasional gastro-intestinal upset. On a dose of 2·2–4·6 gm. Lithium Carbonate a day, in hospital patients he records occasional gastro-intestinal irritability only, while one patient complained of anorexia and one patient became depressed. He reports too, panic, following newspaper stories (unconfirmed) of deaths attributable to Lithium.

Lithium poisoning was reported in 1949 by Corcoran and others (10) who also described the use of Lithium as a salt substitute. Toxic signs included giddiness, nausea, confusion, tremors, and apathy. An addendum to their paper, by G. Masson, suggests that these effects can be prevented by the giving of Sodium Chloride as a supplement. Symptoms mentioned by Hanlon and his co-workers (11)—again using diets low in sodium—included drowsiness, weakness, tremor, nausea, anorexia and confusion. Their patients were under treatment for heart failure and had very large doses of Lithium. (One patient received 13 grams in 3 days.) These observers reported that Lithium is excreted mainly through the urinary tract, with small amounts through the bowel. They also found Lithium in the cerebrospinal fluid three days after ingestion.

Dizziness, fullness in the head, blurring of vision, ringing in the ears, and later weakness and tremor, but no gastro-intestinal symptoms and a continuing good appetite, are described by Cleaveland (12) in experiments on himself. He took doses two or three times as large as the average normal dose (2 gm. Lithium Chloride three times daily, i.e. 6 gm. in 24 hours).

Cameron (13) describes Lithium Chloride as having some depressant action on motor nerves and as weakening the mammalian heart muscle. He states that subcutaneous injection gives rise to gastro-intestinal tract irritation and inflammation and extravasation of blood into the stomach and intestines of experimental animals.

Roberts (14) reports fatal poisoning by Lithium in one of two cases of mania treated. The patient, a female aged 57, with a seven-year history of mania, developed symptoms on the eighth day of treatment, had a number of epileptic fits and died one week later of circulatory failure and status epilepticus. He advocates (and quotes a personal communication from Cade in support) the use of Sodium Chloride to protect against toxic symptoms. Ashburner (3) refers to Roberts's case and in his own series of 50 patients reports only minor toxic manifestations (similar to those described in the present series), and no real intolerance. All his patients were symptom free 24-48 hours after Lithium was omitted and this has also been our finding in the few patients who have shown evidence of toxicity.

Cade considers the Carbonate as better tolerated than the Citrate or Chloride. Toxic symptoms he notes are abdominal pain, nausea, anorexia, occasionally vomiting or diarrhoea, giddiness, ataxia, tremor and slurred speech; a variety of symptoms almost exactly similar in type and probably also in severity to those described as occurring in our present series.

The toxicity of the drug was assayed by Radomski and others (15) whose object it was to observe the effect of Lithium in dogs under different dietary conditions, to study the manner in which the toxic effects were produced and to determine the drug's metabolic fate in the body. They found the drug readily excreted through the kidney and also confirmed the more rapid accumulation and toxic effects if the dietary sodium was restricted. Toxic symptoms in dogs included diuresis, tremors, salivation, lethargy, weakness and weight loss going on to coma and death. They estimate the human toxic dose as likely to be about 1.4 gm. daily if the dietary sodium is restricted.

That the salts of Lithium can give rise to toxic symptoms has certainly been known for a very considerable time. Thus Koplinski (16) in 1898 gave an account of two patients whose gouty conditions were treated with Lithium Citrate. One of them developed weakness, prostration and tremors, and the other tremor, weakness, unsteadiness and depression. In both cases recovery followed withdrawal of the drug. Writing in 1903 Good (17) described nausea, vomiting, diarrhoea, weakness, tremors and stiffness as toxic symptoms in cats.

Similar, though even more severe toxic manifestations are recorded by Greenfield and others (18) using Westsal (an aqueous solution containing 25 per cent. Lithium Chloride) as a salt substitute for flavouring, in hypertensive patients on a low sodium diet. One patient in whom treatment was continued for a very considerable period showed the gastro-intestinal symptoms commonly reported, but later developed weakness and confusion, with restlessness and delirium requiring admission to a psychiatric hospital and later progressing to Cheyne-Stokes respiration. This patient recovered following withdrawal of the Lithium containing compound and was discharged in less than four weeks.

CONCLUSIONS

Lithium salts, which have been described by several writers as of benefit to patients suffering from manic and hypomanic disorders, have been tried in a series of patients followed up over a period of up to three years. Lithium Carbonate has been the salt used and it has shown a markedly therapeutic effect.

Administration of the drug has proved simple: no serious untoward results have been observed and the mild toxic symptoms noted have rapidly disappeared when the drug has been withheld. Few patients have objected to taking the drug, and a number of patients have continued to take maintenance doses as out-patients—one has even voluntarily increased the dose again if there has been any sign of recurrence of symptoms. We have not, however, had any certain success on anyone who commenced treatment on an out-patient basis and all those described have, in fact, been hospital in-patients.

The drug appears to have a specific sedative effect on manic or hypomanic patients. There has been no evidence of any hypnotic action. In those patients where the illness has been a mixed psychosis (schizo-affective disorder), or where there has been a marked affective element it is this affective element which has been so noticeably improved.

From the results recorded here as well as from those of other writers, it would seem that in the salts of Lithium we have a most useful and effective addition to the methods we have at our disposal for treating the affective disorders of the manic and hypomanic type. Such patients are notoriously both unreliable and a source of danger and difficulty to their relatives and families and any method of treatment which proves of benefit is most welcome.

SUMMARY

- (1) Lithium Therapy for the treatment of Affective Disorders is described.
- (2) Results in a series of 58 patients are reported.
- (3) Markedly beneficial effect on manic and hypomanic illness is noted.
- (4) Toxic symptoms are recorded.
- (5) The literature is reviewed and the various writers' findings are compared.
- (6) The conclusion is reached that Lithium Salts can make a most useful contribution in the control of patients suffering from mania or hypomania, whether in hospital or after leaving.
- (7) The possibility of using Lithium Salts to help to stabilize cyclothymic patients undergoing leucotomy is put forward, and it is hoped to make a further study of this.

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CULTURAL ASPECTS OF THE WECHSLER ADULT INTELLIGENCE SCALE IN RELATION TO BRITISH MENTAL PATIENTS

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INTRODUCTION

THE Wechsler Adult Intelligence Scale is now rapidly replacing the Wechsler-Bellevue as the major battery used by British clinical psychologists to test intelligence or intellectual deterioration. The following investigation was conducted to ascertain divergences in British mental patients from the American order of difficulty of items in the Information, Vocabulary and Picture Completion Tests, where both obvious and subtle cultural factors are present. The equivalence of certain possible substitute items was also explored.

PATIENTS INVESTIGATED

The three tests were administered to 50 male and 50 female chronic psychotics whose illness was quiescent and who were in stable hospital employment. The behaviour of such patients in intelligence tests is usually not appreciably different from that of normal subjects. The patients were drawn to the required numbers in strict alphabetical order of name from four appropriate wards, omitting those under 20 or over 59, brain-damaged or epileptic cases and three females who refused to co-operate. Their age-distribution was as follows:

20-34 years, males 23, females 15;

35-44 years, males 13, females 21;

45-59 years, males 14, females 14.

Each test was applied in full precisely as in Wechsler's Manual (1955) with one trivial exception. The substitute items were added at the end of each test.

INFORMATION TEST

Items 1, 6, 9, 11, 14, 17, 20 and 21 show obvious cultural bias. In 11 *American* was changed to *British* without investigation. The substitute items explored were the following:

(a) for 1,

What are the colours of the Union Jack?

(b) for 6,

Name four men who have been Prime Ministers of Great Britain since 1900.

(c) *alternative for 6,*

What is the address of the Prime Minister's official residence in London?

(d) *for 9,*

In what direction would you travel if you went from Manchester to the Isle of Wight?

(e) *for 14,*

When is Armistice Day?

(f) *alternative for 14,*

When is Guy Fawkes Day?

(g) *for 17,*

How far is it from New York to London?

(h) *for 20,*

What is the population of Great Britain?

(i) *for 21,*

Approximately how many members of the House of Commons are there?

(j) *alternative for 21,*

What was the date of the Battle of Hastings?

The standard items were marked according to the Manual. The substitutes were marked according to the same principles except that (i) was marked at three levels of approximation. Table I displays the numbers of patients giving correct and incorrect answers to each item, those omitting to answer it and the rank of the item according to the number giving a correct answer.

If allowance is made for the displacement of previous items, cultural bias does not greatly affect 17 but is serious in 1, 6, 9, 14, 20 and 21. In 17 the substitute is actually harder. In 1, 9 and 20 the substitutes are satisfactory. In 6 the Prime Ministers are harder for the British subjects than the Presidents for Americans; (c) would be a better substitute. Similarly in 21 the House of Commons is harder for Britishers than the Senate for Americans. Here one patient gave the correct number and another seven were within 50 of it; these have been taken as answering correctly. Only another five were within 150. A neat solution would be to substitute item 6 for 21, since a quarter of the patients could name four American presidents since 1900. As to 14, most British anniversaries are either much too easy or much too hard to be equivalents for Washington's birthday. In the Wechsler-Bellevue, Armistice Day was suggested as a suitable equivalent by Reynell (1944) and generally adopted by British clinical psychologists. There are some objections to this. Some people quibble over the fact that observance of this day is now divided between November 11 and the nearest Sunday. Moreover, its general impact has lessened since the Second World War so that the question is much harder for persons under 25. Substitute (f) is clearly too easy; substitute (j) might be a good solution.

With regard to subtler cultural influences, the most striking point is the much greater difficulty of 13 for British persons. The indications are that scientific information is less widely diffused in Britain, while the reverse is true of literary information. If the British ranks are compared with the American ones, allowing for the displacement of previous items, it is evident that among the scientific questions 5, 13, 19, 23 and 25 are all harder for the British, 4 is at the same level and 28 a trifle easier. Among literary items 7, 15, 22, 26, 27 and 29 are all easier for the British and only 24 a trifle harder. In those geographical items without obvious bias the New World 10 is harder for Britishers, while the Old World 12, 16 and 18 are easier.

TABLE I
Information Test

Item Number	Correct Answers	Incorrect Answers	Omitted Answers	Rank According to Correct Answers
1	32	50	18	15th
2	100	0	0	1st equal
3	100	0	0	1st equal
4	86	11	3	3rd
5	79	8	13	5th
6	26	60	14	16th equal
7	84	5	11	4th
8	76	15	9	6th
9	42	19	39	12th
10	48	29	23	11th
11	58	34	8	9th equal
12	68	15	17	7th
13	18	52	30	20th
14	0	22	78	29th
15	67	4	29	8th
16	58	11	31	9th equal
17	26	34	40	16th equal
18	36	37	27	13th
19	20	40	40	19th
20	7	34	59	25th
21	1	41	58	28th
22	33	18	49	14th
23	10	44	46	23rd
24	14	10	76	22nd
25	9	38	53	24th
26	17	23	60	21st
27	23	14	63	18th
28	5	17	78	26th
29	5	24	71	27th
(Substitute Items)				
(a)	97	3	0	Between 1st equal and 3rd
(b)	50	44	6	Between 9th equal and 11th
(c)	81	8	11	Between 4th and 5th
(d)	67	13	20	Equal to 8th
(e)	69	22	9	Between 6th and 7th
(f)	87	9	4	Between 1st equal and 3rd (Harder than (a))
(g)	22	41	37	Between 18th and 19th
(h)	25	30	45	Between 16th equal and 18th
(i)	8	54	38	Between 24th and 25th
(j)	58	15	27	Equal to 9th equal

VOCABULARY TEST

The items (a) *florin* and (b) *dollar* were added as possible substitutes for *penny*. All answers were marked independently according to the criteria by two scorers; discrepancies were identified, discussed between the two scorers and a final mark agreed. Table II shows the numbers of patients giving fully correct, partly correct and incorrect answers to each item, the numbers omitting it, the mean score per item and the rank order of items according to mean score.

When the same language is spoken in two distinct cultures or countries large variations in the difficulty of vocabulary-test items may arise from three possibilities:

TABLE II
Vocabulary Test

Item Number	Fully Correct Answers	Partly Correct Answers	Incorrect Answers	Omitted Answers	Mean Score Per Item	Rank of Mean Score
1	98	0	2	0	1.96	3rd
2	99	0	1	0	1.98	1st equal
3	99	0	1	0	1.98	1st equal
4	41	54	5	0	1.36	12th
5	81	16	3	0	1.78	6th
6	75	25	0	0	1.75	7th
7	43	42	11	4	1.28	15th
8	12	85	3	0	1.09	21st
9	75	13	5	7	1.63	8th
10	74	6	8	12	1.54	9th
11	50	45	4	1	1.45	11th
12	86	11	1	2	1.83	4th
13	19	56	23	2	0.94	23rd
14	40	40	16	4	1.20	18th
15	89	2	6	3	1.80	5th
16	61	12	20	7	1.34	13th equal
17	56	11	11	22	1.23	16th equal
18	25	11	27	37	0.61	31st
19	60	29	9	2	1.49	10th
20	61	12	16	11	1.34	13th equal
21	56	6	16	22	1.18	19th
22	50	23	13	14	1.23	16th equal
23	16	44	14	26	0.76	28th
24	29	31	19	21	0.89	26th
25	42	15	28	15	0.99	22nd
26	40	13	15	32	0.93	24th
27	28	34	21	17	0.90	25th
28	33	11	22	34	0.77	27th
29	56	1	12	31	1.13	20th
30	18	8	20	54	0.44	37th
31	34	12	36	18	0.70	29th
32	25	7	24	44	0.57	33rd equal
33	18	11	23	48	0.47	36th
34	15	29	17	39	0.59	32nd
35	22	7	26	45	0.51	35th
36	14	14	19	53	0.42	38th
37	23	18	20	39	0.64	30th
38	5	2	21	72	0.12	40th
39	24	9	17	50	0.57	33rd equal
40	7	4	22	67	0.18	39th
(Substitute Items)						
(a)	92	0	7	1	1.84	Between 3rd and 4th
(b)	90	0	8	2	1.80	Equal to 5th

- (1) The object or situation denoted may occur less frequently in one culture;
 - (2) A word may be more frequently used or understood in one culture for complex reasons of linguistic history, though the object or situation occurs with equal frequency in both; or
 - (3) The connotation or the limits of denotation may differ in the two cultures, though the word is used with approximately the same frequency in both.
- In adaptation, the rule in the first and second cases is presumably to alter

the order (or in extreme cases to find an appropriate substitute) and in the third case to amend the criteria of marking.

There are no evident instances of the first possibility in the Wechsler Adult Intelligence Scale, though there were several in the Wechsler-Bellevue vocabulary. The second no doubt accounts for the fact that, if allowance is made for the displacement of earlier items, *hasten*, *commence*, *domestic*, *consume*, *obstruct*, *tranquil*, *encumber* and *impale* are substantially easier for the British subjects. Analysis of the wrong answers and consideration of the number of omissions indicate the second possibility likewise as the reason that *sentence*, *regulate*, *designate*, *remorse*, *sanctuary*, *edifice* and *perimeter* are substantially harder for the British. The third possibility, however, seems to explain why *winter*, *fabric* and *slice* were found more difficult by the British patients.

The low rank of *winter* arose because 33 subjects defined it as "season" without mentioning coldness; the vagaries of the British climate probably bring it about that coldness is less exclusively associated with winter than in America. In the case of *fabric* 39 subjects offered "material", partially correct according to the criteria which recognize the textile uses only. In this country, however, *fabric* refers almost as often to buildings as to woven materials and the synonymy of the word with "material" is sanctioned by Chambers' *Twentieth Century Dictionary* (1952). In the case of *slice* 67 subjects offered the notion "piece cut off" without mentioning thinness. Although both Chambers' Dictionary and the *Concise Oxford Dictionary* (1934) warrant the view that *slice* implies thinness in conjunction with breadth, popular usage employs the word literally and metaphorically where thinness is not involved, e.g. "thick slice of cake" or "huge slice out of my life". There seems very good reason to amend the criteria for these three words so far as British subjects are concerned, so as to allow the answers quoted full marks. If this is done, *winter* rises to a rank between *commence* and *repair*, *slice* to one between *repair* and *breakfast*, and *fabric* to one between *breakfast* and *assemble*.

PICTURE COMPLETION TEST

Three drawings were added as possible substitutes for 11 and 13, which show obvious cultural bias. These drawings were of:

- (a) a postage stamp with the monetary value missing;
- (b) a map of the British Isles with Wales missing;
- (c) a weathervane with the tail of the arrow missing.

Table III shows the numbers of patients giving correct and incorrect answers to each item, those omitting to answer it and the rank of the item according to the number giving a correct answer.

If allowance is made for the displacement of previous items, the British subjects found 9, 11, 12, and 13 substantially harder, 14 and 18 substantially easier, than the American order. Items 11 and 13 do not need discussion. No cultural explanation can be readily suggested for 9. In 12 the subjects frequently did not apprehend that the man is walking through snow and their attention tended to be caught by the fact that the dog has no collar (which is of course illegal in Britain in a public place) or lead. The greater ease of 14 presumably arises from a more widespread acquaintance with ports and the sea but that of 18 is difficult to explain. The three substitutes are not very satisfactory unless placed at a different point. In (b) Cornwall would have been a better omission than Wales, since it is perceptually more distinctive.

TABLE III
Picture Completion Test

Item Number	Correct Answers	Incorrect Answers	Omitted Answers	Rank According to Correct Answers
1	86	9	5	1st
2	79	17	4	3rd
3	84	13	3	2nd
4	48	39	13	6th equal
5	76	12	12	4th
6	47	32	21	8th
7	48	31	21	6th equal
8	36	56	8	10th
9	28	59	13	13th
10	31	37	32	11th
11	8	67	25	19th
12	20	55	25	17th
13	3	57	40	21st
14	54	32	14	5th
15	39	50	11	9th
16	26	49	25	14th
17	24	32	44	15th equal
18	29	32	39	12th
19	24	50	26	15th equal
20	6	57	37	20th
21	14	26	60	18th
(Substitute Items)				
(a)	52	32	16	Between 5th and 6th equal
(b)	17	54	29	Between 17th and 18th
(c)	20	38	42	Equal to 17th

SEX AND AGE DIFFERENCES

The two sexes and the three age-groups were compared as to total scores on each test, standard and substitute items being summed. Males were significantly superior to females on Information beyond the 1 per cent. level (*t* ratio) but did not differ significantly on Vocabulary and Picture Completion. In Information males were significantly superior to females (chi-squared or exact method) on items 1, 6, 9, 10, 12, 17, 18, 20 and 23, and also on substitutes (b), (d), (g), (h) and (i). These items are nearly all geographical or political. The suggestion is that a test containing many such items heavily favours masculine over feminine interests and that women should be marked by different norms, if alternative items are not available. In Vocabulary males were significantly superior on *winter*, *fabric*, *sentence*, and *regulate*, females on *repair* and *ponder*, if fully correct answers are compared.

The three age-groups did not differ significantly on Information or Vocabulary. The group aged 20-34 were significantly superior to the other two on Picture Completion at the 1 per cent. (*t* ratio) but the latter did not differ from each other.

ADDENDUM ON SPEED

A cultural trait of British individuals in doing intelligence tests is that they will nearly always stress accuracy at the expense of speed, unless the instructions strongly incline them in the latter direction. If the instructions say nothing about speed but the score depends largely on it, results when assessed against American

norms may be seriously misleading. The effect may perhaps be accentuated in mental patients. This trait was particularly exemplified in the Wechsler-Bellevue on the Digit Symbol Test, and may be illustrated as follows. During the years 1952-54 the Wechsler-Bellevue was applied at Netherne Hospital to a total of 68 patients who were in the age-group 20-39 and in whom there was no psychometric or neuro-psychiatric reason to suspect intellectual deterioration. If the equivalent scores of these on the Digit Symbol Test are compared with their mean equivalent scores on the other tests, the distribution was:

3 or more points above	..	..	..	3
1-2 points above	..	..	..	5
the same	..	..	..	17
1-2 points below	..	..	..	24
3 or more points below	..	..	..	19

Nearly two-thirds were below their mean equivalent score on the other tests.

As speed is in varying degrees important in all the performance tests of the Wechsler Adult Intelligence Scale, it would be desirable to include specific references to it in the instructions for British subjects, if misleading judgments of intellectual deterioration are to be avoided.

SUMMARY

The Information, Vocabulary and Picture Completion Tests of the Wechsler Adult Intelligence Scale were applied to 100 stabilized psychotics at Netherne Hospital, Surrey. Cultural divergences of these from the American order of difficulty of items are outlined and discussed. Males were significantly better than females on the Information Test. A note is added on the tendency of British subjects to stress accuracy at the expense of speed, unless instructions strongly emphasize the latter.

ACKNOWLEDGMENTS

The authors' thanks are due to Dr. R. K. Freudenberg, Physician Superintendent, Netherne Hospital, for facilities to carry out this research. They are also very grateful to Mrs. J. P. A. Gillies, psychological technician, for applying these tests and helping with marking and tabulations.

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VARIETIES OF DISORIENTATION

By

MAX LEVIN, M.D.

DISORIENTATION is not a uniform phenomenon and does not always follow the same pattern. Its pattern varies with its causes. Three varieties may be recognized. (1) The disorientation of toxic delirium. This is the best known variety. (2) The disorientation seen in some cases of schizophrenia. (3) That seen in some cases of brain tumour and other organic brain disease. The three varieties are all different, and the object of this paper is to consider why.

DELIRIOUS DISORIENTATION

The disorientation of toxic delirium is the simplest and the easiest to understand. For our understanding of it we are indebted to Hughlings Jackson, who showed that it is an example of "reduction to a more automatic condition". It was one of his favourite examples.

Delirious disorientation bears a characteristic and unmistakable stamp: the patient tends to mistake the unfamiliar for the familiar (7, 9, 10). Thus a man in hospital will think he is at home, and the nurse he will mistake for his wife. Why did Jackson consider this an example of "reduction to a more automatic condition"?

The functions of the nervous system vary from the most automatic (or least complex) to the least automatic (or most complex). The most automatic functions are the oldest and are mediated by the lowest levels of the nervous system, while the most complex are the newest and are mediated by the highest levels.

By "reduction to a more automatic condition" Jackson meant that when a centre is paralysed, lower centres take over as best they can. Often it is the job of the higher centre to keep lower centres in check, and these are now released from control. A given stimulus will now elicit, not the higher and more complex response, but an inferior and more automatic one. The brain, so to speak, does its best with what it has, like an armless man who writes with his feet.

Jackson considered the delirious man in hospital who mistakes nurse for wife. I have quoted extensively from his writings on this point (7) and a brief statement here will suffice.

Jackson said that a wife represents, to the average man, his "well-organized symbol-image" of woman. The woman a man knows best is his wife; her image therefore is his "symbol" image of woman. When he thinks of "woman" the image activated or closest to being activated is that of his wife, just as when an Englishman thinks of "language" he will, if anything, think of English. When a man sees another woman, an act of discrimination takes place, as if he says to himself, "This is a woman other than my wife." To be sure, this act of discrimination is unconscious.

The wife, said Jackson, is a "well-organized" symbol-image. The lowest levels of the nervous system are the most highly organized, for they are the oldest and the most firmly established. Since a man sees his wife and thinks of her more often than of other women, the neural pathways corresponding to her image are the most highly organized. Practice makes for organization. The more

you practice an act, the more automatic does it become, and the more highly organized does its neural substrate become.

Physicians sometimes make the mistake of supposing that the highest centres are *more* highly organized than the lowest. Thus one writer speaks of the control exercised by the highest centres "over automatic and unorganized" lower centres. Another, referring to Jackson's three levels, speaks of the highest as the "third and most highly organized level". These writers confuse "organized" and "complex", two things that are *inversely* related. The highest centres are the most complex, but the *least* highly organized. The most highly organized centre is that whose component parts are most firmly interconnected. It is that which functions most stably under the widest variety of conditions. On this view the most highly organized centres are the lowest. Thus the centres for circulation and respiration are so highly organized that they function day and night under all but extreme conditions. By contrast, the highest centres are so slightly organized that they are easily affected by adverse influences: a little alcohol will befuddle the mind. Were the highest centres the *most* highly organized, the mind would lack agility and plasticity; people would be too rigid, and would be unable to meet new and unexpected conditions (10).

So when a man lays eyes on his wife, the neural pathways that come into action are well organized. Recognition of his wife is a simple and automatic act. When, however, he sees another woman, a double event occurs. The simpler pathway is activated (corresponding to the idea "This is my wife") but a higher and more complex pathway is activated too (corresponding to the idea "This is not my wife but another woman"). The higher pathway asserts itself over the lower one, and the discrimination is made. But if he is delirious, the discrimination is apt to founder. The simpler event alone will occur; the "well-organized symbol-image" alone will be roused and will stand uncorrected, and he will mistake the woman for his wife.

Difficulty in grasping the unfamiliar gives rise not only to disorientation but to various other misinterpretations. Thus a farmer was brought to the hospital in delirium tremens. Hearing the scratchy sounds of an ancient phonograph at the other end of the ward, he mistook them for the crowing of a rooster.

Another example, reported by Jackson (3), is that of a "sack dealer (who) was delirious during erysipelas. The house-surgeon opened a small abscess in one eyelid, while the patient was in a straitjacket. The patient's account of these circumstances was that he had been to a public house, that the landlord fastened him down with two sacks, and then poked out one eye." This man in his delirium failed to grasp the novel and unfamiliar experience of an operation on the eye. A man who presumably was no stranger to the pubs in his neighbourhood, he grasped the event in terms of a bar-room brawl.

It is remarkable that this tendency in toxic delirium, to mistake unfamiliar for familiar, was known to Jackson, who was not a psychiatrist, while it escaped the notice of Kraepelin. Jackson at heart was a physiologist, and was quick to see anything that exemplifies a physiological principle.

PARANOID DISORIENTATION

Some schizophrenics are disoriented. A schizophrenic, like anyone else, may be stricken with toxic delirium. Then too, those who are not delirious may be disoriented from delusions in respect of their environment. In either case the disorientation bears a characteristic stamp.

I will call the disorientation of a schizophrenic "paranoid disorientation",

as opposed to "delirious disorientation", which refers to that of a man who is delirious but not also schizophrenic.

The two varieties of disorientation differ profoundly. They share the same name, disorientation, but otherwise have almost nothing in common. Two differences are known.

(1) The delirious man has no idea he is disoriented. The schizophrenic, by contrast, knows that you differ from him, or at any rate, *pretend* to differ with him, in his conception of the environment. He believes *he* is right, not you, and thinks you have a motive for pretending to differ from him (e.g. he may think you are testing his mind). An example is Case 4 in an earlier paper (4). This woman, after a bromide delirium, sank into a schizophrenic dementia. She now knew the place was, as she put it, "*supposed*" to be the Harrisburg State Hospital, but she didn't believe it. She was convinced it was 1933, though the rest of us said it was 1931. She thought we said 1931 to see if we could deceive her and so test her mind. Letters postmarked 1931 did not convince her, for she said they could be two years old, though they looked clean and fresh. The dateline on the newspaper was equally unconvincing; she said the papers destined for the hospital were misdated. I offered to take her into town and let her buy a paper at any news stand. She declined the offer, saying that even then the false dating could somehow be pre-arranged.

(2) The delirious man who is not schizophrenic thinks in familiar grooves. The hospital he mistakes for his home, the nurse for his wife. The farmer noted above mistook the scratchy sound of the phonograph for the crowing of a rooster. In sharp contrast, the disorientation of the schizophrenic is shot through with the remote, the bizarre, the exotic. At the Harrisburg State Hospital, whose patients, drawn from the rural counties of central Pennsylvania, had seldom been out of the country and sometimes not even out of the State, I saw disoriented schizophrenics who named the place as Italy, Alaska, Ethiopia, China, Japan and the planet Mars. Delirious patients have often taken me for a son or relative or a man in some familiar occupation, such as a teacher or lawyer, but it was a schizophrenic who (in an alcoholic delirium) mistook me for Chancellor Dollfuss (in 1934, when Dollfuss was in the news).

This second difference is striking. When a schizophrenic becomes delirious, his schizophrenic traits—aloofness, bizarre thinking, etc.—remain manifest. By contrast, when a non-schizophrenic becomes delirious, there is a homely air about him. Sick as he is, his aspect and behaviour are the opposite of bizarre. Typical is the man in an alcoholic delirium who, when I walked into his room, courteously asked me to sit down and said he would try to find me something to drink. He thought he was at home and acted accordingly.

In pointing out the distinctive marks of delirious and paranoid disorientation, I do not mean to imply there are never any exceptions. If one talks to a delirious man often enough to collect a hundred examples of his disorientation, there may be a few examples that will fall out of the common pattern.

Paranoid disorientation is obviously a more complex phenomenon than delirious disorientation. In toxic delirium the disturbance is relatively simple. The higher the centre, the more vulnerable it is to poison. There is therefore a relatively harmonious pattern of dissolution, with "reduction to a more automatic condition". In paranoid disorientation the disturbance is not so simple. Here we have to deal with personal idiosyncrasies, perversities, complexes and evasions, and the problem, like schizophrenia itself, does not admit of simple physiological formulation.

DISORIENTATION IN ORGANIC BRAIN DISEASE

There have been noteworthy reports on disorientation in brain tumour and other organic disease by Paterson and Zangwill (11, 12, 13), Gooddy and Reinhold (1, 2), Weinstein and his associates (14, 15) and others. These authors have found many remarkable patterns of disorientation associated with paraphasia, agnosia and denial of illness.

In respect of pattern of disorientation there is an outstanding difference between toxic delirium and focal organic disease. In any group of cases of toxic delirium there will be more or less uniformity, whereas in cases of focal disease such as tumour the disorientation, if any is present, will show no such uniformity. To be more specific, in obeying the "law" of the unfamiliar mistaken for the familiar, the cases of delirium follow a common principle, whereas in tumour cases with disorientation there is great diversity, each case seemingly a law unto itself. The reason for this is clear. In toxic delirium there is no discrete lesion as in tumour. The poison has invaded all parts of the brain, not just one cerebellar hemisphere or a part of one frontal lobe. Since the entire brain is involved and since the highest centres are the most vulnerable to poison, there is a certain uniformity of result; there is "reduction to a more automatic condition", manifesting itself in the tendency to mistake unfamiliar for familiar. No such uniformity is seen in the tumour cases; in them, when disorientation occurs, its characteristics will depend on how high the tumour is situated, on whether there is involvement of areas dealing with speech and mentation, etc. Hence in tumour we should expect no two cases to be alike.

Double Orientation. The many diverse patterns of orientation in organic disease cannot all be considered here. I will consider only the common occurrence of "double orientation", in which the patient, while disoriented, is yet in some degree correctly aware of his environment. As Weinstein and Kahn said (14), "the correct and the faulty identifications (exist) side by side". One of their patients in the Mount Sinai Hospital said "she was in her apartment in Ridgewood which was also the Mount Sinai Hospital". Other patients said "they were in a restaurant or hotel but named it 'Mount Sinai Restaurant' or 'Mount Sinai Hotel.'" One patient "claimed the hospital and his home were actually in the same building".

A remarkable example of double orientation was in the case of a friend in another city whom I did not see in his illness. The facts were reported to me. He had an international reputation in one of the social sciences, but had never found a proper scope for his talents. He lived in a city I will call Metropolis. He died of cancer of the lung, and for some weeks before death was in a grandiose paranoid state, so that he may have had cerebral metastases. In this state he believed he was a high official in the League of Nations (this was in 1939). He believed the city was Geneva, yet knew that when he looked out of the window he saw the familiar skyline of Metropolis. He reconciled these ideas by saying that the League had gone to the fantastic expense of erecting a replica of Metropolis in the heart of Geneva.

Double orientation is quite a different thing from the typical disorientation of toxic delirium, in which there is simply a mistaking of unfamiliar for familiar. It has been suggested by some that there is an incongruity here. I disagree. The seeming incongruity springs from a difference in the degree of cerebral involvement. As regards cerebral function the tumour patient is not as sick as the man in toxic delirium. We see this in their disorientation. From the standpoint of orientation, the delirious man is farther off the beam. He is "all wrong", whereas the tumour patient with double orientation is only "half wrong", for while he

misnames the place he at the same time grasps, albeit inadequately, its true nature. The patient who called the place a restaurant also had some grasp of the fact that it was the Mount Sinai Hospital, for he called it the "Mount Sinai Restaurant". It stands to reason that such a man is not as sick, not as abnormal, as one who calls the hospital his home with no inkling of anything to the contrary. This is not a matter of prognosis. If we had to choose between toxic delirium and brain tumour, we would take our chances with the former. But cerebral dissolution is more profound in delirium, since *all* the cortex has been affected by the poison. The tumour patient with double orientation is not so completely bereft of his senses, since only a part of his cortex has been affected.

I therefore do not agree that there is an incongruity. It is not puzzling at all that brain tumour and toxic delirium differ in pattern of disorientation. On the contrary, it would be puzzling if they did *not* differ.

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Reviews

The Mental Hospital. By ALFRED H. STANTON, M.D., and MORRIS S. SCHWARTZ, Ph.D.
Tavistock Publications, Ltd., London, 1954. Pp. 492+xx. Price 35s.

This book describes aspects of a small American mental hospital over a five-year period, during which 270 patients were admitted. Half were schizophrenics, 60 per cent. of whom had been ill for over two years. By English standards the staff:patient ratio and standard of individual attention to patients were extremely high and the fees fabulous. Psycho-analysis was the only formal treatment provided.

The authors' avowed intention is to elucidate the bearing on the outcome of the illness of the patients' experiences during time not spent with the analyst. Some patients improve "spontaneously" shortly after admission to hospital; when the garbled speech of an excited patient is with patience understood and difficulty over a mundane matter explained he becomes tranquil. In what conditions do such beneficial changes occur? A wealth of observation bearing on this and similar questions is derived from a searching survey of the hospital structure and the function of the individuals forming it, enabling the authors to illustrate in vivid and convincing detail many general principles; disturbing behaviour is related to neglect of individual wishes and requirements; disregard for wise rules and routine produces disorganization, bewilderment and tension; suppression of individuality and initiative gives bleak and fruitless uniformity.

Unfortunately, a lengthy appraisal of the psychiatric treatment carried out does not permit significant conclusions to be drawn. About half the non-senile cases were discharged to the community but their condition at the beginning of treatment was not stated. As in many mental hospitals, the medical records are not sufficient to draw reliable conclusions and the doctor's memory is relied on to provide ratings.

The last section of the book deals with three special problems common in mental hospitals. The authors comment on them in terms of the relationship between the patient and others in the institution. Observations about three patients indicated that incontinence was a method of showing self-depreciation, anger and similar emotions where other methods of expression were less effective or unavailable. Excitement in patients was observed in conjunction with disagreements between members of the staff and it appeared that as the differences between the staff were resolved the patients' excitement diminished.

Thirdly, the merits and consequences of granting "special privileges" (i.e. allowing breaches of hospital rule or custom) to individual patients in certain circumstances are extensively documented. The misgivings, resentment, heart-searching and turmoil caused to those most immediately concerned are fascinatingly revealed in a verbatim report of the discussion of a particular problem of this kind set in its background. It makes an effective commentary on human relationships in other settings.

The authors were widely separated and otherwise occupied after they had collected their material and while preparing it for publication. The book unfortunately reflects this in a verbose and imprecise manner of writing. It could have been shorter with benefit. The fifteen tables printed at the end could have been condensed without loss to the reader and it is difficult to see who, except the people concerned, will be interested in a three-page list of publications by the doctors at the hospital. Nevertheless, the book merits careful reading and thought from doctors and laymen whose work materially affects the lives of patients in mental hospitals. DAVID C. WATT.

Lie Detection and Criminal Interrogation. By FRED E. INBAU and JOHN E. REID.
The Williams and Wilkins Company, Baltimore, U.S.A.; Baillière, Tindall and Cox, London.

This, the third edition of the book published in 1942, is most easily discussed in two parts—as it has been written.

In the first part the authors describe a method of continuous recording of physiological variables and the application of such recording in the interrogation of suspect persons.

After paying tribute to Sir James Mackenzie's development of "The Ink Polygraph" (*Brit. Med. J.*, 13 June, 1908), and discussing the earlier attempts by Marston, Benussi, Burt and Larson, the authors describe the "Keeler Polygraph" and the "Reid Polygraph", with which the majority of their records were obtained. The physiological variables under investigation are blood pressure, pulse and respiration recorded by pneumatically operated mechanical recorders and the psychogalvanic reflex (P.G.R.): changing muscle tension—as the subject's muscle pressure changes when exerted by forearms, thighs and feet—is also recorded. The recording technique, with appropriate illustrations, is fully described.

It must be remembered throughout that the book is devoted to the "interrogation" of suspects by Law Enforcement Officers. The technique of interrogation is treated in detail and it is apparent that the authors are practised in the method.

Among the examples of "question form" two merit mention—the "control question" test and the "peak of tension" test.

Many illustrations are given of records obtained from subjects under interrogation.

The authors estimate that during a five-year period their experience goes to show that, when applied under the most favourable conditions, they can expect an accuracy of 95 per cent. with a 4 per cent. margin of indefinite determinations and a 1 per cent. margin of possible error. This estimate involved a study of 4,280 subjects.

The second part of the book deals with various techniques in interrogation without the use of recording apparatus.

Again, methods recommended by the authors are discussed in great detail and illustrated by specific cases. It is, at once, apparent to the reader that considerable variation exists in the operation of law from State to State.

In such a matter as the issuing of a warning to an offender as to his constitutional rights—before obtaining his confession—only under the Uniform Code of Military Justice (Armed Forces), and in the State of Texas, is such a warning specifically required.

The courts have also apparently held that the validity of a confession is unaffected by the fact that it was obtained by the use of trickery or deception on the part of the interrogator—subject to the exception that the trick or deception must not be of such a nature as to be likely to produce an untrue confession.

Throughout these chapters illustrative cases are discussed, often in colloquial language.

The whole work is one of some interest, but it has little application at present to British forensic methods.

It is somewhat burdened by its copious footnotes which make reading a little hard at times: there are one or two minor printing errors, and the constant "splitting of the infinitive" irked your reviewer.

It is, however, a serious attempt to present the subject and the authors have been at pains to fulfil their task.

R. SESSIONS HODGE.

The Unconscious Origin of Berkeley's Philosophy. By J. H. WISDOM. The Hogarth Press and the Institute of Psycho-analysis, London, 1953. Pp. 244. Price 25s.

It may be that Philosophy and Psycho-analysis have both somewhat lost their way, but the power inherent in their combination is undeniably expressed in this book.

Further to this Mr. Wisdom has added a psychosomatic contribution associating the psychological mechanism of the hypochondria and intestinal trouble from which Berkeley suffered with his philosophy.

The book then is a *tour de force*, a synthesis of different disciplines and an attempt to see life whole which earns respect.

C. E. H. TURNER.

The First Interview with a Psychiatrist. By CHARLES BERG. George Allen and Unwin, 1955. Pp. 240. Price 18s.

The author seeks to demonstrate that in every interview there are, underlying manifest and conscious phenomena, forces at work hidden from most participants. He comments on interviews of various kinds and describes medical interviews in a number of settings; in hospital, in general practice, a psychiatrist's interview and the highly formalized analytical interview. Commonsense advice is offered here; the doctor should be patient and polite and not keep the patient waiting unnecessarily; he should be encouraging but not too talkative. Extracts from the author's interviews with his patients form the main part of the book and the moral of each tale is underlined. The psycho-analytical theory of the development of instincts is expounded; human behaviour is viewed as a conflict of primitive urges which are the mainspring of human life and restraining fears which are both a morbid inheritance from infancy and a product of social forces. Gradations of sexual activity from total inhibition to nymphomania are portrayed by one group of cases; a further group exemplifies resistance and transference. Theory is touched on lightly, however and does not detract from the author's main role of *raconteur*.

The book's aim, an exposition of the unconscious forces in all interviews, is hardly to be taken seriously. This work could less misleadingly have been called "Leaves from a psycho-analyst's case-book", indicating that it is designed as a popular exposition of the author's craft. His style is casual and anecdotal; a pleasant chat following a game of tennis is regarded as an interview; the State is admonished for "behaving . . . like a barbarous parent of the Stone Age" and advised to take lessons from the analyst's note-book. It is surprising to find stated in the glossary that schizophrenia is characterized by progressive dementia.

DAVID C. WATT.

The Initial Interview in Psychiatric Practice. By M. GILL, R. NEWMAN and F. C. REDLICH. International Universities Press, Inc., New York. Pp. 423, including bibliography and index.

This book can be divided into three sections; discussion of the literature, the authors' views and three verbatim interview reports with the authors' comments on them. Gramophone records of these interviews are available, but the reviewer has not heard them.

Henderson and Gillespie, Noyes, Preu and others are straightway taken to task for the type of interview they recommend; they require full and detailed history, ignore the patient/doctor relationship and describe a systematic approach. Persistence in this method is ascribed by the authors to the psychiatrist's need to demonstrate his superiority, to defend himself against the anxiety provoked by his patients' experiences and to cope with his own insecurity. Psycho-analysis has altered this, but not immediately. Glover, Appel and Strecker, Ebaugh and others advocate a more flexible interview but still cling to diagnosis and reconstruction of the patient's history. Finesinger proposes that initially the psychiatrist should try "to define the subject matter and areas to be explored"; this is bad. J. Coleman, F. Powdermaker, F. Fromm-Reichmann and H. S. Sullivan are then quoted with approval. These authors advocate elucidating a problem rather than making a diagnosis and feel that the initial interview, unhampered by systematic enquiry, is a sample of the patient's mode of life in so far as it bears on his illness. In the non-directive interview, described by Carl Rogers, assessing, evaluating and appraisal are eschewed as "anti-therapeutic". Here the final diagnostician is the client or patient. The authors are not prepared to go this length and feel that the advocates of such principles do not really adhere to them.

The authors' recommended interview has, as its purposes, rapport with the patient, diagnostic appraisal and reinforcement of the patient's wish for treatment. The diagnostic appraisal includes a mixture of psychopathology and borrowings from "systematic" psychiatry. Direct enquiry is permitted on practical matters affecting psychotherapy, such as the time available and financial resources of the patient, but

in all else the patient's leads are followed. There is a short description of interview recording and the reactions of patient and therapist to it. The reported interviews clearly indicate how these principles operate in practice.

The authors are to be commended on this exposition of their method, but they are less than fair to other points of view. Having narrowed their problem to selection of patients for psychotherapy, they can legitimately compare their procedure only with others having the same purpose. They do not state how they would select patients for other types of treatment, although they criticize the procedure of psychiatrists who have this aim. Having obtained information that can be adequately provided by "old-time" psychiatry, their criteria of suitability for psychotherapy are "ego-strength" and the nature of the patient's defences. They may be right; it will require further careful enquiry to demonstrate it.

DAVID C. WATT.

Wartime Psychiatry. A Compendium of the International Literature. Edited by N. D. C. LEWIS and B. ENGLE. New York. Oxford University Press, 1954. Pp. 952, including index of authors.

This large compilation is divided into fourteen sections, entitled "Aviation", "Psychoses", "Special Therapies", "Problems of Combat" and so on. One thousand one hundred and sixty-three articles and books are fully reviewed. There are 169 additional titles many with short reviews, and the titles of 93 books not reviewed. A short preface to each section admirably indicates the background and setting from which the group of articles arose. The reviews are of a high standard and the production excellent.

The general preface indicates several questions which wartime psychiatry raises. None could be answered from this book, as its information is for practical purposes unavailable. The titles of sections and of the articles reviewed are insufficient indication of their matter to allow useful reference. This volume is a treasure house lacking its key—a subject index.

DAVID C. WATT.

Migration and Mental Disease—A Study of First Admissions to Hospitals for Mental Disease, New York, 1939-1941. By BENJAMIN MALZBERG and EVERETT S. LEE. New York Social Science Research Council (1956).

It is generally believed that the incidence of mental disease is higher among migrants than among non-migrants and that the difference is attributable either to selection of poorer risks at the places of origin or to stresses of migration and adjustment at places of destination. The object of this analysis was to study the inter-relationship between migration and mental disease in New York State. The basic data consisted of first admissions to New York State hospitals for mental diseases from 1 July, 1938 to 30 June, 1941, and the first admissions to veterans' and licensed hospitals for the last of these three years, the only year for which they are available. The combined first admissions exceeded 46,000 (42,563 whites of whom 15,033 were foreign born and 4,059 non-whites including 536 immigrants) and were classified as dementia praecox, manic depressive psychoses or "all other psychoses" at the time of admission. All comparisons were based on age-standardized rates. The hospital and census data were such that only nativity, colour, sex and age could be controlled, but these include the most important factors governing the rates of mental diseases in various population groups. After examining the adequacy of the material and the problem of diagnosis, consideration is then given to differences arising from nationality, place of birth and period of migration.

For both white and negro males and females, dementia praecox accounted for about 55 to 65 per cent. of all first admissions at ages 15-24, but the proportion decreased sharply to less than a third at ages 40-44 and to about a tenth at ages 50-54. For manic depressive psychoses, however, there were marked sex and racial differences.

For white males in any age group, these psychoses accounted for less than 10 per cent. of the first admissions while for white females the proportion was greater than 10 per cent. and was as much as 22 per cent. of the total psychoses in the 35-39 age group. Among negro males, manic depressive psychoses were unimportant numerically, never accounting for more than 5 per cent. of admissions for any age, while for negro females the pattern was similar to that for white females, except the proportion of total first admissions never reached 10 per cent. In the older ages cerebral arteriosclerosis and senile psychoses dominated. For both these conditions, admissions first appeared in appreciable numbers in the sixties. At ages 60-64 at least half of the total first admissions of both white and negroes were due to cerebral arteriosclerosis while senile psychoses represented 10 to 20 per cent. of total first admissions at ages 65-69 and about 45 to 65 per cent. of those aged 75 or over. Between 30 and 60 years, there was a variety of psychoses with some marked sex and race differences. Alcoholic psychoses and general paresis were especially important for white males and negroes of both sexes though almost negligible for white females. Involutional psychoses were dominant for white females between 40 and 60 years and accounted for over a third of total first admissions in the early fifties. Among white males and negro females the proportions were much lower (about 15 per cent. in the early fifties) while in negro males they were insignificant.

Among white males there was a clear excess of first admissions of the foreign-born for dementia praecox, but no differences of any importance in the overall rates of manic depressive psychoses or of psychoses other than dementia praecox and manic depressive. For white females, however, the age-standardized rates for the foreign-born were well above those for native whites with respect to each of the psychoses examined and there were few age groups in which the rates for the foreign-born were not above those of natives for any psychoses. The rates for total psychoses for native and foreign-born non-white females were almost equal, but among non-white males the rate for the foreign-born was some 13 per cent. lower. For dementia praecox, however, higher rates were found among the foreign-born of both sexes. Were it not for the important contribution of this psychosis to total first admissions, age-standardized rates for all types of mental disease would be about 25 per cent. lower for foreign-born males and 15 per cent. for foreign-born females than for native non-whites of the same sex. Foreign-born non-whites rates were generally below foreign-born whites but the reverse held good in regard to females. The difference in the males is probably explained by social and economic factors, while in the case of females, it is suggested that they make a less satisfactory adjustment to migration than males or alternatively, female immigrants are not as well "selected" as the male immigrants. For all persons, the rates of dementia praecox were higher for foreign-born than for natives which is consistent with the hypothesis that schizophrenics or persons with schizoid personalities are likely to migrate or that the stresses of migration and adjustment to the new environment are more likely to produce schizophrenia than other mental diseases.

When the native population was segregated into those born in New York State and those born elsewhere, it was found that the rates of first admission for total psychoses, for dementia praecox and probably for psychoses with cerebral arteriosclerosis and senile psychoses were appreciably higher for migrants than for non-migrants. Among white females this was also true of manic depressive psychoses. Further, except for dementia praecox, the rates of first admissions of native migrants were usually much higher than those of the foreign-born. The difference between the rates of the foreign-born and non-migrants was greater for females than for males in each category of psychoses, and this difference also held good among native white migrants but not among non-white.

An examination of admissions in relation to time left no doubt that the risk of first admission to hospital for mental disease was much greater for recent arrivals in New York State than for the combined population of earlier migrants and non-migrants. For both sexes and for residents in each geographic area, the age-standardized rates for white migrants were at least twice those for non-migrants and among non-whites the differentials were even greater. The incidence of mental disease would appear to be

high among recent migrants declining with time towards the relatively low level of the indigenous population. No firm deduction can be made on this point, however, since a population distribution of migrants by year in New York State is not available. There are indications that in-migration is sometimes followed quickly by out-migration so that an accurate estimate of the population at risk is precarious.

Although it is shown that the rates for mental disease as well as first admissions were greater for migrants than for non-migrants, several qualifications must be borne in mind. Firstly, a higher proportion of the migrants than non-migrants lived in rural areas where it is easier to care for the harmless mentally disordered person at home. Secondly, it is possible that the patients might have been admitted at younger ages in the states from which they came had the same standards of admission applied as in New York State. Thirdly, the same factors that impel migration may also result in mental disease or early stages of mental disease may be accompanied by migration. Lastly, New York State is decidedly atypical and this in itself may make it highly attractive to the less stable individuals.

A. BARR.

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The Psychodynamics of the "Dry Drunk"

The authors' study of the responses of the 52 respondents to the questionnaire on the dry drunk leads them to the following conclusions:

1. The dry drunk is experienced by the majority of alcoholics who have maintained sobriety over a long period.
2. The occupation of an alcoholic has no statistical significance in maintaining sobriety.
3. A number of alcoholics will drink from 10 to 20 years before they begin to maintain sobriety.
4. Dry drunks generally occur within the first year of sobriety (occasionally during the early months).
5. This symptom occurs irregularly and with diminishing intensity as the period of sobriety lengthens.
6. The dry drunk is characterized by a feeling of deep depression and frustration and by indecision regarding taking a drink.
7. "Inner life" is largely responsible for precipitating a dry drunk.
8. The dry drunk often is preceded by the same feelings.

* A number of abstracts in this section are reproduced from *Chemical Abstracts*. To the Editors of this Journal we extend our grateful thanks.

9. The principal feelings after a dry drunk are relief and thankfulness at not drinking during this period of craving.
10. Drugs are not used to combat the moods and feelings of a dry drunk nor to produce similar feelings.
11. Alcoholics are irritable, restless, and impatient during a dry drunk.
12. After a dry drunk one's thoughts, feelings, and behavior return to normal.
13. A.A. members are the persons most helpful during a dry drunk while spouses, other members of the family, and former drinking companions are the least helpful.
14. Dry drunks may be prevented by contacts with A.A. and efforts to keep the mind off the drinking problem.
15. Dry drunks are generally related to one's mood swings.
16. The financial status generally improves when sobriety is maintained over an extended period.
17. The dry drunks described by the authors' respondents have a number of the same characteristics as the "late withdrawal symptoms" described by Wellman.

The authors feel that this study has been useful in clarifying their thinking on the dry drunk, in indicating sources of help for persons who are experiencing or may suffer dry drunks, and in pointing out areas for further study. They are impressed with the thoughtful, painstaking way in which the questionnaires were answered and with the willingness of the respondents to elaborate in detail on their experiences.

(Authors' Abstr.)

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Evaluation of Combined Coramine-Electroshock Therapy in the Treatment of Schizophrenia

1. Thirteen schizophrenic female patients from among consecutive new admissions were given 5 c.c. coramine in conjunction with their regular series of EST, and a roughly comparable group of 13 patients received saline injections with their EST.

2. These patients were given the Wechsler-Bellevue Intelligence Scale and the Bender-Gestalt test just prior to their shock series and were retested 5 weeks following their last treatment.

3. Results indicate that EST used in conjunction with coramine significantly decreased the time spent in EST treatment. Patients receiving coramine returned to a higher level of intellectual functioning and more adequately perceived reality than did their controls as measured by psychological tests.

4. It is hypothesized that coramine-EST brings about an increased blood flow and thalamic stimulation occurs with most of the results being similar in quality, but greater in quantity, to those with standard EST. The one major qualitative difference noted in contrast with standard EST treatment was the lowering of inadequate defences. The use of coramine-EST makes "intensive-treatment EST" for excited patients unnecessary, thereby avoiding the undesirable post-treatment confusion and clinical organic symptoms.

5. Coramine-EST patients experience less fear and appear more receptive to psychotherapy. Acutely ill new admissions benefit most.

6. This is a pilot study and the results should be considered tentative in view of the size of the authors' sample. A 2-year follow-up of these patients would be necessary to draw any definite conclusions as to the permanency of the effects of coramine-EST. The marked tendency

in favor of the coramine-EST group does, however, warrant further investigation of coramine as a variation in EST.

(Authors' Abstr.)

Contribution to the Survey of Handwriting

1. By applying technical methods and mathematical principles to the survey of Gestalt in handwriting the shift from solely intuitional comprehension to scientific testing and practical evaluation is begun.

2. The tests are performed with the help of a map measure, a simple device which makes a quick integrative measuring possible.

3. On scripts of 27 apparently normal individuals the following hypothesis is tested and found to be justified: The total of the length of words, measured in the middle zone of letters, is related to the total length of lines according to the principle of the "Golden section".

4. Among 25 institutionalized mental patients were 9 cases whose scripts revealed proportions not conforming with the principle of the "golden section".

5. The results of this investigation, evaluated by tests of significance, advocate this method as a sort of graphometrical screening test. The author intends to supplement it with other tests, according to the principles of integrative survey.

(Author's Abstr.)

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Clinical Evaluation of Azacyclonol, Chlorpromazine, and Reserpine on a Group of Chronic Psychotic Patients

1. Clinical evaluations of azacyclonol, reserpine, and chlorpromazine were made in turn on the same group of chronic, moderately disturbed, psychotic patients, most of whom revealed schizophrenic reactions maintained through long hospitalization.

2. Beneficial results were obtained with each of the three drugs, but not necessarily in the same patients; nor were all patients helped by any one drug.

3. Consideration of the total number of patient improvements in the authors' limited series showed reserpine to be best, closely followed by chlorpromazine, and then by azacyclonol.

4. From the analysis of the results in relation to the different diagnostic categories, it would seem that the hebephrenic and hebephreno-catatonic patients were helped most by reserpine, next came azacyclonol, while chlorpromazine was least effective. In the treatment of paranoid patients chlorpromazine was most beneficial, followed by reserpine, and then by azacyclonol. The schizo-affective patients exhibited best improvement with chlorpromazine. One case of involuntary depression was strikingly benefited by reserpine.

5. Limiting the validity of these conclusions to the types of patients studied the authors find that it is possible to differentiate between the use of each of these drugs in different psychiatric categories and to indicate the choice of drug that may prove most useful in the treatment of a given case.

(Authors' Abstr.)

Use of Reserpine in Disturbed Psychotic Patients

1. Reserpine is definitely of value in the treatment of chronically disturbed psychotic patients. Twenty-one per cent. of a group of 150 such patients have improved sufficiently to leave the hospital. Eighty-four per cent. showed some degree of improvement and 70 per cent. did better on reserpine than on electroshock.

2. Long duration of hospitalization was an unfavorable factor, although 4 (5.6 per cent.) of those who had been continuously hospitalized for more than 5 years improved sufficiently to go home, and 80 per cent. showed some improvement.

3. Although certain toxic effects (including Parkinsonism and convulsions) have been observed, none was permanent; all of them disappeared when the dosage of reserpine was reduced.

4. There is evidence that in some patients the therapeutic effect of reserpine lasts only as long as the drug is being administered.

(Authors' Abstr.)

Both drugs are of particular value for the patient with chronic, relapsing, but non-deteriorating schizophrenia who could not otherwise adjust successfully outside the hospital. (Authors' Abstr.)

Reserpine

Four groups of eight severely disturbed, chronic schizophrenic patients were selected by the ward psychiatrist. One group received group psychotherapy and the new drug reserpine; another received psychotherapy and a placebo; the third group received only the drug, reserpine, and the fourth group acted as a control. After six months of treatment, behavioral changes were measured. No significant improvement occurred on the psychological tests. Marked improvement occurred with behavioral measures. The greatest improvement occurred when reserpine was used along with group psychotherapy.

(Authors' Abstr.)

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Presenile Dementia of the Jakob Type

The clinical and pathological features of two patients affected with a primary form of presenile dementia are described. The first patient, aged 59 years, showed, in addition to intellectual deterioration, neurological symptoms and signs similar to those of amyotrophic lateral sclerosis. In the second patient neurological signs were limited to occasional muscular twitchings, dysarthria, occasional tremors, and terminal inability to swallow. In both patients the mental symptomatology was of the type usually associated with diffuse structural lesions of the brain. The course of the disease, progressive and relatively rapid, was 16 months in the first patient and 14 months in the second. The pathological lesions consisted of widespread degenerative lesions of the neurons with concomitant neuroglia reaction. In the two patients morphologic changes were similar in type; in distribution they differed somewhat, the spinal cord and medulla bearing the brunt of the lesions in Case 1, while in Case 2 the cortex and thalamus were more severely involved.

These findings are compared with those reported in cases of presenile dementias, which have been labeled Jakob's, Creutzfeldt's, Heidenhain's or Kraepelin's disease. Since clinical and pathological features are similar in all these conditions, it is suggested that, in the absence of a better knowledge of etiologic factors, they be grouped into a single clinicopathologic syndrome under the term corticostriospinal degeneration, first proposed by Wilson.

(Authors' Abstr.)

The Psychophysics of Communication

Critical flicker fusion threshold (CFF) is a valid method for measuring the parameter of discriminatory awareness.

The (CFF) was measured in 131 healthy, fluent, control subjects and in 46 stutterers and was found to be significantly depressed in the latter group. Conditions of testing were identical; the possible influence of age and sex was insignificant.

The interrelationship of the communication process as an aspect of thinking, of the discriminatory component of consciousness, and of the neurological implications of the (CFF) is discussed.

(Authors' Abstr.)

Functional Localization in the Cerebellum

This paper supports the concept of functional organization of the cerebellum in longitudinal, corticonuclear zones and is opposed to that theory which localizes function in the various lobes defined by comparative and embryological data.

The previous evidence of functional organization, obtained by stimulation and ablation, has been interpreted chiefly on the basis of the distribution of cerebellar afferent systems. The present concept emphasizes the efferent projections, originally defined anatomically by Jansen and Brodal. Their specific corticonuclear connections, described in Marchi studies, are supported by selective nuclear gliosis following cortical lesions seen in Nissl preparations.

The vermal zone consists of two contiguous, but independent, halves, composed of cortex and fastigial nucleus, each of which controls the posture, tone, locomotion, and equilibrium of the entire body and functionally resembles closely the extrapyramidal portion of the cerebrum. No qualitative difference exists between the symptoms following ablation of the vermal cortex of the anterior lobe and the rostral one-half of the fastigial nuclei and those following the ablation of the posterior lobe of the vermis (and nodulus) and the caudal one-half of the fastigial nuclei. Somatotopic localization is present in the vermal cortex, with maximal involvement of the tail in the lingula; hindlegs and pelvic girdle, in the centralis and rostral culmen; forelegs, pectoral girdle, head, and neck, in the caudal culmen; head, neck, and forelegs, in the simplex and head, neck, and eyes in the tuber and folium. However,

the entire body was involved to a less pronounced extent in each lesion. Localization in the fastigial nucleus had a similar orientation, but its minimal representation was limited to the fore- or hindparts of the body.

Vestibular function is not limited to the flocculonodular lobe, but is a function of the entire vermal zone. The vermis is an anatomical unit, based on its electrical stimulation and ablation.

Each paravermal, intermediate zone, consisting of paravermal cortex and nucleus interpositus, controls the postural placing and hopping reflexes, tone, and individual movements of the ipsilateral limbs, and functionally resembles the pyramidal part of the cerebrum. The function of this zone is similar in the anterior and the posterior lobe, being quantitatively greater in the former except that the regulation of tactile placing is a property of the anterior lobe only. Somatotopic localization in the cerebellum reaches its greatest discreteness in the paravermal cortex, especially that in the anterior lobe.

The cortex of the lateral zone in the cat does not appear to be involved in the regulation of posture or progression, whether this is tested by cerebellar lesion alone or such a lesion combined with destruction of the sensorimotor cortex of the cerebrum. The postural function of the dentate nucleus is limited at most to a regulation of placing and hopping reflexes and volitional movements of the ipsilateral limbs. No somatotopic localization was found in the lateral zone, although it has not been exhaustively explored.

The inclusion of the so-called middle lobe vermis (tuber and folium) and the paramedian lobule with Crura I and II as a functional unit is strongly opposed by the evidence presented here. The tuber and folium belong with the vermal zone; the paramedian lobule belongs with the paravermal zone. Likewise, the anterior lobe cannot be referred to as a single functional unit, nor can it properly be termed vermis alone.

The symptoms obtained from the nuclei of the vermal and paravermal zones are the reciprocal of those characteristic of their respective cortices. This reciprocity was obvious following even small cortical and nuclear lesions, which show precise somatotopic localization. This observation appears to demonstrate beyond question that these nuclei have both an afferent supply and a function independent of the cerebellar cortex.

(Authors' Abstr.)

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The Insula. Further Observations on its Function

Information, derived from the stimulation and removal of the insula of man, has accumulated during the past ten years since the publication of case J.C. whenever opportunity permitted. This evidence has now been reviewed by one of the authors and new methods of observation employed.

More than one-third of the positive sensory responses to stimulation of the insula consisted in sensations that resemble the responses to stimulation of the superior bank of the fissure of Sylvius, responses considered to be second-sensory. The decision as to whether this is any evidence of neighbourhood activation or whether some part of the insular cortex is involved in a somatic sensory mechanism must be left an open question.

Gastric recording, by means of an electrogastrograph and an intragastric rubber balloon during operation, has demonstrated clearly that, in conscious men, the island of Reil can exert a control over gastric motility and stomach tone.

Electrical stimulation of the insula produced, in 4 out of 6 cases, undoubted effects upon the stomach. These effects varied from complete inhibition of gastric motility to the production of violent activity with marked increase in tone. Tone changes might accompany, or appear independent of, alterations in rate of stomach contractions.

In this series of observations, whenever abdominal sensation was produced by stimulation during gastric recording, there was some concomitant change in gastric tone or motility, either inhibitory or acceleratory. On the other hand motor effects were sometimes produced without accompanying sensation.

It must also be left an open question as to whether abdominal and epigastric sensation has any representation in this region independent of the changes produced in motility and tone of the gastro-intestinal system. Somatic sensation and abdominal sensation may be

produced by stimulations of near-by points on the insula but they are not produced simultaneously during one application of the stimulating electrode.

Complete insulectomy produced inhibition of the previously existing 3 per minute pyloric contractions and a fall in gastric tone (case W.G.). This occurred toward the end of excision. A few minutes later, irregular 1 per minute contractions were set up, unlike any gastric activity previously recorded, and continued several hours up to the end of the recording. There were three other total insulectomies but gastric recording was not being carried out during the procedures.

Control studies of gastric motility during similar operations when other parts of the cerebral cortex were stimulated or removed gave no evidence of motor responses.

More than one-third of the positive sensory responses to stimulation of the insula consisted in an abdominal feeling of some sort and it is assumed that most, if not all, of these sensations are secondary to motor change in the gastro-intestinal tract.

(Authors' Abstr.)

Rhesus Incompatibility and Mental Deficiency

Nine cases of certified mental defect with a history of icterus neonatorum are presented. It is thought that the mental defect and brain damage are due to rhesus incompatibility. A tenth case with similar clinical features but probably not due to this cause and an eleventh where rhesus damage was complicated by lipoidosis are also reported.

The quality and extent of the damage varied very widely. A typical picture of athetosis, deafness and mental retardation could be recognized but may not be peculiar to this condition. Atypical pictures included ataxia and hemiplegia. The degree of mental impairment varied from complete idiocy to normal intelligence which was obscured by the multiple defect. Pathological studies showed widespread damage in the brain with emphasis on the globus pallidus but not sparing the cerebral cortex. The first 6 cases received no adequate treatment by modern standards and might have escaped brain damage if so treated. The last 3 affected at birth received modern treatment but for which they would probably have died. Three of the cases were potentially educable. Education of such cases needs much individual attention with special regard to deafness and ample opportunity for graded manual and general muscular training. The history of the study of rhesus factor incompatibility illustrates the preventability of certain forms of mental defect.

(Authors' Abstr.)

Lipid Chemistry of the Brain in Demyelinating Diseases

Phospholipids, cholesterol, various phosphorus-holding compounds, neutral fat and neuraminic acid have been estimated in 3 further cases of multiple sclerosis and 1 of diffuse sclerosis of the sudanophilic type and in other varieties of diffuse sclerosis and these results are given in full.

There is a generalized loss of phospholipids in the demyelinated areas in all conditions. The new cases of multiple sclerosis confirm previous findings not only as to the presence of cholesterol esters but also as to the slight abnormality of the apparently normal areas. Changes in phosphoprotein phosphorus levels are discussed and suggestions for future investigations are outlined.

Neuraminic acid has been found to be raised not only in amaurotic family idiocy but also in all the demyelinating conditions so far examined.

It is suggested that it may be possible to assist diagnosis by the chemical examination of biopsy specimens of cerebral material and an example of such an examination is given.

(Author's Abstr.)

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The Electroencephalogram in Forensic Alcoholism

1. The observation of electroencephalographic findings is reported in 60 patients who had an electroencephalogram before, during, and after the administration of alcohol.

2. Of the 60 patients, 12 showed electrical seizure discharges after the administration of alcohol.

3. Ten of the 12 patients who showed electrical seizure discharges had electroencephalographic instability before the administration of alcohol, suggesting predisposition to paroxysmal cerebral dysrhythmia.

4. Only four patients (of the 60) had clinical seizures following the administration of alcohol.

5. Factors responsible for producing electroencephalographic abnormalities similar to those activated by alcohol are discussed.

6. The mechanism by which alcohol produces convulsions in certain individuals is not clear.

7. The writer does not recommend the routine use of alcohol as an activator of electrical seizure discharges. However, this procedure may be useful only in specific patients in whom it is suspected that some criminal or unsocial act was performed while in a state of altered consciousness, a result of alcohol intake.

(Author's Abstr.)

Case Studies in Cerebral Anoxia

This brief report is concerned with characteristic clinical cerebral residuals in a case of prolonged respiratory failure incident to drowning in a girl of six years. She survived for a period of almost six days. On gross examination, the cortical and ganglionic gray matter appeared to be diffusely softened. Architectural and cellular changes characteristic of cerebral anoxia were found on microscopic examination in the form of minor focal arachnoidal thickening, laminar pallor and friability, early endothelial proliferation, acute severe changes in the cortical and lenticular nerve cells, calcareous deposits in the striatal blood vessels and foci of subcortical demyelination.

(Author's Abstr.)

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A Year's Experience with Frenquel in Clinical and Experimental Schizophrenic Psychoses

1. The therapeutic properties of Frenquel, alpha-(4-piperidyl) benzhydrol hydrochloride, have been under study for the past twelve months. The foregoing is an account of an exploratory adventure in therapeutics rather than a statistical study.

2. The therapeutic indication for the use of Frenquel appears to be confined to schizophrenic dissociation syndromes, and it is unique in this regard. It is not consistently successful in relieving such disorders.

3. It acts as a partial or complete blocking agent against the development of LSD-25 and mescaline experimental psychoses when it is given as a premedication to healthy subjects who ingest these hallucinogenic drugs. When injected intravenously during the height of such experimental psychoses it brings them to an abrupt end. Preliminary observations suggest that it fails to perform the same function in model psychoses produced by pyrahexyl, a cannabis-like drug.

4. In a small series of cases of acute schizophrenia, Frenquel has relieved the disorder rapidly in about a third of the cases. Electro-convulsive therapy increases the number of favorable responses in this group. After relief of symptoms it appears necessary to keep the patient on a maintenance dose of the drug to prevent relapse.

5. In chronic schizophrenia it is also of therapeutic value in a small number of cases, and its effectiveness appears to be enhanced by the simultaneous use of chlorpromazine and/or E.C.T. on occasion.

6. Preliminary observations suggest that it is also of therapeutic value in some of the psychotic reactions arising out of chronic alcoholism, but inconsistently so, especially in low doses.

7. The periodic dissociation reactions which occur in senile patients with organic brain syndromes have responded to Frenquel treatment in a small number of cases, and the authors are encouraged to enlarge their clinical observations on this group.

8. In high doses, given both intravenously and orally, the drug has also relieved post-operative confusional states, which in their opinion appear to be quite similar clinically to acute schizophrenic reactions. Larger experience may reveal that this is one of the more hopeful therapeutic indications for the use of the drug.

9. The authors have given Frenquel for a large assortment of other neurological and psychiatric disorders without benefit. The one possible exception is that of acute intermittent porphyria. In two cases of this disorder abdominal complaints have been minimized, but neurological and psychiatric components of the syndrome have remained unaltered during two months of treatment. A larger and more prolonged series of observations will be necessary to confirm this curious finding.

10. Review of the 115 cases in this study has led to the conclusion that Frenquel appears to be a wholly non-toxic compound, and no subjective complaints of side-reactions have arisen from its use. No incompatibilities with other drugs have been noted, with the possible exception of sulfonamides. In one case of post-operative confusion the authors gained the impression that Frenquel was inactivated by the simultaneous use of a sulfonamide.

11. As their experience has broadened, they have been emboldened to use Frenquel in higher doses both intravenously and orally. In the acute dissociation syndromes especially, they now give the drug intravenously in 100 mg. doses as soon as the diagnosis is established, and follow with as much as 300-400 mg. orally per day in divided doses. This appears to enhance the therapeutic benefit of the drug without jeopardizing the health of the patient.

12. Frenquel appears to have a place, though a limited one, along with chlorpromazine and reserpine, among the ataractic drugs, i.e. those which bring about ataraxy, or freedom from confusion. The drug is worthy of further study.

(Authors' Abstr.)

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An Evaluation of the Treatment of Schizophrenia with the Antidiuretic Hormone of the Posterior Pituitary

1. First admissions of schizophrenic patients to the State Hospital have been studied.
2. The patients have been subdivided into two groups, on the basis of treatment received; one group received Pitressin, one did not.
3. The groups are comparable for age, but show significant difference in prehospital duration of illness—the Pitressin group has the shorter duration. This has been discussed.
4. The results have been assessed on the basis of discharge and readmission, length of stay in hospital and length of remission.
5. The results are significantly better in the group not receiving Pitressin.
6. It is thought that antidiuretic hormone (Pitressin) is not an effective agent in the treatment of acute and moderately chronic schizophrenic illness.

(Author's Abstr.)

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Frenquel

Frenquel offers a new neuropharmacologic approach to certain acute psychotic states where delusions and hallucinations have been the primary symptoms. In certain selected cases, early results have been encouraging. In patients whose psychoses are associated with organic brain deterioration or chronic brain syndromes, the results have been poor, but the authors feel that the medication can safely be utilized for a trial of therapy in these patients. The authors are unable to explain why Frenquel is beneficial in some patients with organic psychoses and not in others. The most encouraging results have been in the treatment of acute toxic hallucinosis, where all but 3 of the patients were relieved of their symptoms within a few hours.

The authors offer this report only as a preliminary one. Further and more intensive studies are being carried out by them. Follow-up studies must be done in these patients before long-term evaluation of the drug can be presented.

(Authors' Abstr.)

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Studies of the Toxicity of Schizophrenic Blood Serum

There are many possible reasons for the failure of these experiments to demonstrate a toxic factor in the blood serum of schizophrenics as there are a number of factors not subject to control when dealing with such complex material. The known unpredictable viability of young tadpoles as demonstrated by spontaneous deaths occurring in groups not exposed to serum may be an important factor, but this really explains very little. *Bufo valliceps* tadpoles may have special metabolic processes which make them peculiarly unfit as test organisms, and for the *Rana catesbiana* series the conditions of the experiments by Lazell and Prince may not have been reduplicated. There is, however, no obvious reason why the experiments failed to demonstrate a toxic factor.

Objectively, the only conclusion warranted is that by employing a technique reported previously by several workers, a toxic factor in the blood serum of schizophrenics was not demonstrated using a large number of a new genus and species of tadpoles and one previously used, and using planaria. No definitive statement can be made about the toxicity of schizophrenic urine as the sample is too small.

(Author's Abstr.)

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Studies of Cerebral Circulation in Brain Injury. II. Cerebral Concussion

1. The EEG, SP, cortical temperature, oxygen availability, intracranial and jugular venous pressure, blood pressure and respirations have been recorded in experimental cerebral concussion produced by percussion concussion, compression concussion and acceleration concussion.

2. In experimental concussion there is a rapidly reversible cortical injury potential (SP) followed by a rapid rise in cortical oxygen availability (EPG) preceding any effects referable to changes in respiration and circulation. The intensity of this primary change is proportional to the objective signs of concussion (loss of corneal reflex, respiratory paralysis, rise in blood pressure and diminished EEG activity). Following the blow there is a rise in cortical temperature. It is concluded that this primary change occurs in all nerve cells that are affected, and that generalization of the phenomenon is due to the affection of all neurones by the stimulus. The essential process can be localized in one region by limiting the adequate physical stimulus to that region.

3. There is a threshold for the stimulus necessary to produce concussion. Progressively severe blows over the threshold stimulus produce more severe concussion. Repeated concussive blows tend to lower the threshold. A severe concussive blow may be fatal without signs of brain injury.

4. The cortical injury potential, rather than neuronal excitation, accounts for the large potentials recorded immediately following a concussive blow. The rise in cortical (EPG) and the surface negative (SP) potential are contrary to the changes induced by cortical paroxysmal activity, and their ability to summate with rapid repetition negates their origin from nerve impulses whether reflex or not.

5. The effect of localized percussive paralysis of the brain stem is contrasted with localized percussive paralysis of the cortex.

6. It is concluded that in cerebral concussion transient traumatic paralysis of neurones due to membrane damage is the essential effect. This membrane damage accounts for the prolonged after-effect on synaptic transmission.

(Authors' Abstr.)

The Electroencephalogram in Phenylpyruvic Oligophrenia

Electroencephalographic studies in the waking and sleeping state of 19 patients with phenylpyruvic oligophrenia reveal that waking activity in these patients is usually abnormal; it is of high voltage, slightly fast, slightly slow, or a mixture of fast and slow; seizure discharges of the petit mal type are common. Eleven patients showed seizure activity in the waking state and 18 had seizure activity during sleep. Thus the electroencephalogram confirms the clinical observation that epileptic disorder is a common complication in phenylpyruvic oligophrenia.

The occurrence of 3/sec. spike and wave discharges of the petit mal type in more than one-third of the present group of patients with phenylpyruvic oligophrenia is noteworthy because this pattern is rare in other types of symptomatic epilepsy. It suggests that there is some causal relation between the metabolic disorder which is present in phenylpyruvic oligophrenia and the wave and spike pattern.

The most consistent abnormality was a lack of well formed sleep patterns. Biparietal humps and spindles were either absent or poorly developed. Sleep activity was profoundly disorganized. In two cases mitten patterns were present.

These findings suggested a pathological process with a strong epileptic component, causing a profound disturbance of both cortical and thalamic function.

(Authors' Abstr.)

The Electroencephalogram in Patients with Tuberous Sclerosis

Twenty patients with tuberous sclerosis and 13 clinically healthy siblings of these patients have been examined electroencephalographically. Four out of 7 patients with severe cerebral affection (epilepsy and mental deficiency) showed an abnormal EEG; one out of 8 patients with epilepsy, but without mental deficiency, had an abnormal record; 5 patients with skin manifestations and no sign of affection of the CNS had normal records. Thirteen healthy siblings showed normal EEG's except in 2 cases. It must be remarked that only passive recording, with overbreathing as the only method of activation, has been studied. It is concluded that EEG examination is of no aid in revealing cerebral affection in patients without disorders sufficiently severe to cause mental deficiency. No diagnostic pattern is found.

(Authors' Abstr.)

Observations on the Diffuse Thalamic Projections

Extensive cortical ablations and focal lesions of the striatum were made in cats and monkeys, and the degeneration of the thalamic nuclei was studied in Nissl stain after survival periods of at least two months. Degeneration in the thalamus does not follow in an "all or

nothing" manner. Between the extremes of entirely normal appearance and complete degeneration with loss of ganglion cells and heavy gliosis, there exist an array of intermediate changes. Their significance in the organization of thalamic efferents is discussed.

Lesions restricted to the caudate nucleus or putamen did not produce degeneration in the thalamic nuclei. Lesions of the caudate nucleus which involved the adjacent portion of the internal capsule were followed by extensive cell loss and gliosis which involved the oral portion of the reticular nucleus, the nucleus ventralis anterior and the oral portions of the intralaminar nuclei. Lesions placed in different regions of the internal capsule and oral portion of the thalamus showed the presence of an anatomical rostral outflow.

Cortical removals consisted of hemidecortication, either complete or limited to the isocortex. In addition to degeneration of the specific projection nuclei, marked changes were present in the intralaminar nuclei. The changes were observed after removal of the isocortex alone with varying amounts of damage to the underlying white matter. In complete hemidecortication, the extent of degeneration of the intralaminar nuclei was only slightly modified. The details of these findings are presented and their significance discussed.

(Authors' Abstr.)

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Studies of Cerebral Circulation in Brain Injury. III. Cerebral Contusion, Laceration and Brain Stem Injury

1. Experimental cerebral contusion, laceration, herniation and brain stem injury have been studied in terms of local cortical oxygen availability, blood flow, and pH together with local EEG, SP, respiratory and blood pressure changes.
2. Contusion of the brain results in a local injury potential which is more prolonged and slower in development than the diffuse neuronal injury potential of concussion.
3. Within 1-3 minutes of the injury causing contusion evidence of localized impaired circulation and tissue hypoxia become evident. These changes coincide with the visible development of petechial hemorrhages. Such local ischemic and hypoxic changes may result in local EEG abnormalities.
4. Cerebral laceration results in the rapid onset of more extensive ischemia and hypoxia due to local reduction of arterial pressure and arterial spasm.
5. Brain stem ischemia results in a severe rise in blood pressure and increased cortical circulation.
6. Brain stem contusion results in a fall in blood pressure with resultant cerebral ischemia and hypoxia.
7. Brain trauma causes first a local transient paralysis of neurones complicated in later stages by the effects of ischemia, anoxia and resulting metabolic disturbances. In contusion these secondary effects over-shadow the paralytic effects.

(Author's Abstr.)

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The Formal Aspects of Schizophrenic Verbal Communication

It was the purpose of this study to make more precise the nature of the inadequacy of schizophrenic verbal communication. The hypothesis advanced was that schizophrenics, as compared with normal adults, manifest a lower, socially less differentiated level of communication.

The characteristic formal aspects of the schizophrenic's verbal communication were

systematically investigated by creating a relatively structured situation. The subject was told a short story and instructed to relate it to the interlocutor. The interlocutor, controlling the situation, purposely created an argumentative situation by disagreeing with the subject's story; they both were required to discuss these differences and arrive at an acceptable solution.

The subjects consisted of 30 male schizophrenics—10 hebephrenics, 10 catatonics, 10 paranoids—and 20 normal male adults. The two groups were compared with regard to three major aspects of verbal communication: Task Orientation; Social Reactivity; and Linguistic Thought.

The data, statistically analyzed in terms of a number of categories, yielded the following results:

(a) Task Orientation. The task orientation of the schizophrenics, as compared with the normals, was characteristically impaired, i.e. they were unable to focus their behavior consistently on the task. Closely related to this behavior was the concreteness of symbolic activity, viz. they were unable to assume the hypothetical attitude necessary for dealing with a task involving fictitious events.

(b) Social Reactivity. Typically, the discussion of the schizophrenics, as compared with the flexible communicative behavior of the normals, largely remained unmodified in the interpersonal situation.

(c) Linguistic Thought. The schizophrenics' verbal expressions of thinking, as compared with those of the normals, showed a certain degree of diffuseness and inarticulateness.

The findings suggest the following generalizations:

(a) The communicative activity of the schizophrenic is formally different from that of the normal adult. He is obliged to communicate on a lower socio-genetic, less differentiated level.

(b) The level of organization of the schizophrenic is relatively wide-ranged, i.e. he is not fixated at one particular point along the developmental scale; rather his activity is characterized by a predominance of behavior at a particular low level with higher, more mature levels occasionally manifesting themselves. Therefore, vestiges of adequate communicative activity are more or less retained.

(c) The hebephrenics evidence the greatest degree of undifferentiatedness in communicative activity due to their greater autistic involvement. The catatonics and the paranoids are somewhat closer to normals but show this difference with respect to one another: the catatonics tend to approximate normals more closely in their social behavior and task orientation whereas the paranoids tend to approximate normals more closely in their thinking.

The schizophrenic's low level of communicative activity brought out in this study may be interpreted in terms of the general genetic concept of undifferentiated ego-world relationships. Accordingly, the study suggests that the inadequacy in communicating with others is an expression of (a) the undifferentiatedness of inner and external speech, and (b) the inability to take the role of the "generalized other". With a heightening of autistic activity there is a lessening of the degree of differentiation between inner and external speech and between one's ego and his surrounding world.

(Author's Abstr.)

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Depressive Reactions Associated with Temporal Lobe Uncinate Seizures

1. Paroxysmal depressive reactions lasting for hours to weeks occurred in six subjects whose chief seizure manifestations consisted of uncinate attacks and temporal lobe automatisms.

2. Depressive episodes preceded or followed seizures or occurred paroxysmally in the "free interval" between seizures. These episodes had a rather sudden onset, were refractory to psychotherapy, and frequently disappeared abruptly under energetic anticonvulsant therapy or Metamphetamine hydrochloride (Desoxyn)/Dextroamphetamine sulfate (Dexedrine) medication.

3. Accompanying olfactory hallucinations also ceased once the depression subsided.

4. Two patients could be followed clinically and electroencephalographically over several years. A definite relationship between temporal lobe paroxysms in the EEG and depressive episodes clinically could be demonstrated.

5. It is postulated that this particular type of depressive reaction may be due to sub-clinical "hippocampal-amygdaloid-temporal lobe" epilepsy and/or due to after-discharges from the same structures following manifest seizure activation.

(Author's Abstr.)

The Capillary System in Patients with Psychiatric Disorder: the Ontogenetic Structural Determination of the Nailfold Capillaries as Observed by Photomicroscopy

1. Drawings and photomicrographs of the capillary structure of the nailfold skin of the ring fingers of both hands were examined in 332 subjects. Of these 96 were healthy controls, 40 were psychiatric patients with psychopathic personality, 73 patients with psychoneurosis, 15 patients with epilepsy, 58 patients with depression and 50 were patients with schizophrenia.

2. Nine distinct Categories of capillary structure are distinguished as representing stages in capillary maturation or dysplasia of the growth process. The incidence of each Category in eight diagnostic groups is evaluated and the results subjected to analyses of variance to assess their significance.

3. It was found that no significant differences existed between the records of the two hands and that age, within the range of 18 to 58 years, could be discounted as a variable.

4. Specific patterns of nailfold capillary structure were found to characterize the healthy subjects and patients with each of seven varieties of psychiatric disturbance. The results possessed statistical validity and a supplementary analysis by a second observer yielded adequate reliability.

5. It is inferred from the results that the nailfold capillary morphology is indicative of personality structure, liability to psychiatric breakdown and that it represents an index of constitutional maturation.

(Author's Abstr.)

Long Range Treatment of Multiple Sclerosis with Pancorphen

This article deals with the question whether a series of 5 Pancorphen injections which yielded a high percentage of partial remissions of non-permanent nature in a large number of cases should be repeated and how often. Can the author expect on repetition: (1) a cure of the disease? (2) prevention of new attacks? (3) lengthening of intervals between the attacks? (4) shortening or cure of new attacks?

He bases his conclusions on 7 cases of multiple (more than 3) treatments from Goldwater Memorial Hospital. To these cases he could add 6 more cases from his previously published series. All these cases were treated and followed for years.

His tentative conclusions from these thirteen cases are: (1) even old and advanced cases can still yield partial remissions of various degrees; (2) this result can often be repeated; (3) there is no doubt in most instances about the sequence and the probable causal nexus between treatment and remission; (4) repeated treatments given in time can favorably influence the course of the disease; (5) the treatment in the form hitherto described produces no cure; (6) a repetition of the treatment from 4 to 26 times in its present form does not arrest the disease or protect from relapses in the future; (7) very advanced cases give less favorable results than less advanced; (8) treatments started in the beginning of an attack give much better results than those started late in the attack; (9) treatments given 2 to 3 times per year are probably better than those given at longer intervals; (10) treatments given in a remission period probably further the progress of remission; (11) progressive type of remission is more frequent with Pancorphen treatment than without it; (12) the interval between bouts of disease is not shortened, but the total time spent in attacks is shortened; (13) the duration of an attack is shortened to a point that we can speak of "aborted attacks".

Should the treatment be continued indefinitely 3 times a year in series of five injections? More experience with much longer periods of treatment will be necessary to answer this question conclusively.

The author is convinced that the treatment should be given: (1) in every beginning attack; (2) in progressive (active) attacks no matter of what duration; (3) during inactive as well as progressive remissions. It is true that treatment in active stages requires more caution and still more individualization than in the inactive stages; it is also true that any aggravation of the disease in a progressive attack is likely to be interpreted not as absence of therapeutic effect but as iatrogenic aggravation. Nevertheless it is logical to assume and corroborated by experience that the active periods of disease, progressive or new attacks as well as progressive remissions, hold more promise for any therapy than the inactive periods of stabilized defenses which also yield therapeutic results.

For the time being he recommends therefore: continuous treatments with series of five intravenous injections, strictly individualized three to four times per year plus extra emergency treatment in case of appearance of new symptoms.

(Author's Abstr.)

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Plasma Tyrosine in Schizophrenia

1. Determinations of free fasting plasma tyrosine were made on 32 chronic male schizophrenics and 16 male controls of similar age.

2. There was no significant difference in the values for free fasting plasma tyrosine when the schizophrenic group was compared to the control group. Figures for both groups were in agreement with accepted values.

3. The Spectral-Transmittance (S-T) curves of chromophores obtained by the colorimetric method used were plotted for each subject between 400 and 700 m μ .

4. Mean S-T curves for schizophrenics and controls did not differ significantly, and no individual gave curves which differed significantly from the mean curve for his group. Since substituted phenols other than tyrosine, presumably representing intermediate metabolites of tyrosine, are involved in the reaction of the method used, producing colored compounds which affect the (S-T) curve specifically, the results suggest that the intermediate metabolism of tyrosine is not deranged in schizophrenia.

5. The results obtained do not support the hypothesis that schizophrenia may represent a state of disorder metabolism involving the chemistry of tyrosine.

(Author's Abstr.)

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The Copper Content of Brain and Liver in Hepatic Encephalopathy

Copper analyses of the lenticular nucleus of the brain (putamen) and the liver were made in 11 cases of chronic liver disease dying in coma, and in 11 control cases. The derangement of central nervous function known as hepatic encephalopathy (liver coma) does not appear to be associated with a consistent increase in the total copper content of either the brain or the liver.

(Author's Abstr.)

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An Evaluation of the Rorschach Method for the Study of Brain Injury

Using the configurational approach, the Rorschach method is able to differentiate between post-traumatically brain injured patients and schizophrenic and neurotic patients without organic pathology. The configurational approach in which Rorschach patterns are studied in their dynamic interrelationships within the individual record and in which the qualitative features of the record are considered, appears to be effective in describing the personality of the post-traumatic patient, detecting personality deviation and diagnosing organic cerebral dysfunction. These configurations are therefore offered for further study and verification by other Rorschach clinicians. The use of the configurational approach depends upon interpretive skill which comes with extensive experience and training. It is the authors' belief that the configurational approach can be made systematic and can attain a practical degree of objectivity.

(Authors' Abstr.)

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Chlorpromazine and Human Spasticity

The authors' original electromyographic observations on the effect of chlorpromazine on human spasticity have been expanded. In 15 of 18 patients dramatic abolition of spasticity for about two hours was obtained by the rapid intravenous injection of not more than 50 mg., with lesser effects in the other three. In a boy with cerebral palsy the effect lasted more than 20 hours.

Voluntary muscular activity was unaffected except in one quadriplegic who reported a brief transient paralysis of a partially-affected limb.

The effects are not related to the state of consciousness. Most patients remained highly co-operative, though some became quite sleepy.

No effect on the involuntary movements or the reflexes was recorded in five cases of choreoathetosis and no depression was seen in a normal subject's neuromuscular responses.

Two cases of parkinsonian tremor were relieved temporarily, in contrast to the occasional appearance of such a tremor in long term therapy for psychosis with chlorpromazine and reserpine.

The possible modes of action are discussed. The effect is apparently a depression of over-balanced facilitatory influences of the brainstem reticular nuclei.

(Authors' Abstr.)

Treatment of Bell's Palsy with Cortisone and Other Measures

1. Bell's palsy is an easily recognized illness, but before therapy is started the patient should be carefully examined to exclude other types of facial paralysis and other pathology.

2. The usual slow recovery and possible permanent disfigurement justify active, aggressive treatment if such treatment appears to be effective.

3. Surgical decompressive measures, plastic repairs, and nerve anastomoses are procedures of last resort and leave much to be desired in reliability and effectiveness.

4. From the data summarized above, oral cortisone appears to be an effective means of treatment if the following criteria are observed: Treatment must begin as soon as possible, at least in the first nine days. Treatment should be adequate; that is, minimum initial doses of 300 mg. per day for an adult, with gradual decrease over a seven to ten day period.

5. Further information should be collected on a large number of cases of Bell's palsy treated with cortisone and related substances with varying dosage schedules to determine the optimum therapy under varying circumstances.

(Author's Abstr.)

Treatment of Muscular Dystrophy with Amino Acids and Vitamins

Clinical evaluation of the Van Meter treatment for muscular dystrophy, consisting of amino acid, folic acid, and vitamin B₁₂, indicated no significant improvement in muscle performance in a series of patients studied with a control group. In addition, the Van Meter treatment did not alter the biochemical abnormalities of creatinine and creatine excretions in the urine of patients with muscular dystrophy.

Therefore, it is the authors' opinion that treatment of muscular dystrophy with amino acid, folic acid, and vitamin B₁₂ is of no value, either in a definitive or symptomatic sense.
(Authors' Abstr.)

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Craniovascular Studies in Headache

1. The supposed mechanism of extracranial arterial volume changes occurring during a migraine attack is in keeping with the authors' findings of the subjective or objective response to Dihydroergotamine, which succeeded in diminishing the volume pulse amplitude and easing the headache in a significant number of patients.

2. In patients with muscle contraction headache, a sufficiently significant number of patients evidenced such response to nicotinic acid as to postulate the belief that a local vascular insufficiency might play a definite part in the mechanism of pain. It may well be that such an insufficiency occurs secondarily to local muscle contraction.

3. The effects of drugs were felt by the patients before associated changes could be recorded objectively.

4. The field of pulse wave tracings and study is one in which understanding of the significance of the tracings is constantly growing. There are certain findings present in our recordings, the significance of which are not yet fully understood but which will be clarified by further experience.

(Authors' Abstr.)

Swelling of the Brain Induced by Anoxia

Fourteen dogs under pentobarbital sodium anesthesia survived respiratory anoxia severe enough to give a decrease in blood pressure below 40 mm. of mercury and as much as two minutes of cardiac arrest. These animals did not exhibit any noticeable swelling of their brains or increase in intracranial pressure clearly attributable to cerebral edema within several hours after the anoxic episode. But one animal surviving a longer period of cardiac arrest (six minutes) caused by inhalation of nitrogen later showed a progressive elevation of the intracranial pressure. Histologically there was evidence of cerebral edema.

Local anoxia of brain tissue, induced by oil or starch emboli, consistently caused a very rapid swelling of the brain and an increase in the intracranial pressure in the absence of any obvious systemic hemodynamic change (20 animals). A significant part of this swelling may be attributed to intracellular accumulation of fluid. There was, also, in some of these brains histologic evidence of extracellular cerebral edema.

(Authors' Abstr.)

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Effect of Mesencephalic Lesions on Metrazol-Induced Cortical Activity

The data presented suggest that Metrazol is a rapidly acting toxic substance which produces long lasting depression of the threshold of the cells of the central nervous system. The precise pattern of cerebral activity which results from such a depression depends on the nature of the available cellular interconnections. Where the cortex is isolated from the mesencephalic reticular formation, there results a loss of capacity for it to respond with

sustained high voltage hypersynchrony, irrespective of the nature of the seizure inducing agent used.

(Authors' Abstr.)

Experimental Production of Seizures in the Macaque by Temporal Lobe Lesions

Irritating lesions were created by placing alumina cream in the temporal lobes of five monkeys. Observations of temporal lobe seizures, and evidence for grand mal seizures in three of these animals are given. A discussion of these findings and some of their implications are presented.

(Author's Abstr.)

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Reaction of the Adrenal Cortex to Emotional Stress

Adrenocortical reaction to emotional stress was determined in groups of subjects who were studied during life situations of emotional perturbation, as well as under conditions of experimentally contrived emotional disturbances.

The level of the 17-hydroxycorticosteroids in the peripheral blood and 17-hydroxycorticosteroids conjugated as glucuronides in the urine served as the measures of adrenocortical function.

These emotional disturbances caused consistent but modest increases in the 17-hydroxycorticosteroids in the blood and urine. Plasma steroid values remained within the normal physiological range under the influence of emotional upset. These changes were less than those observed following the intravenous administration of ACTH, Piromen, insulin, or electroshock treatment and moderate exercise.

(Authors' Abstr.)

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1. Biochemistry, Physiology, Pathology, etc.

Experimental Psychiatry. *Buscaino, V. M.* [Gazz. sanit., **20**, 417 (1949); *Excerpta Med.*, Sect. VIII, **3**, 635 (1950).]

In experiments on man and animals, mescaline, diethyllysergamide, and the alkaloid of *Opuntia cylindrica* cause syndromes resembling schizophrenia (I). Bulbocapnine produces a motor effect resembling catatonic (I). The possible toxic pathogenesis of spontaneous (I) by metabolic production of organic bases is discussed.

W. C. TOBIE (Chem. Abstr.)

Ammonia Formation and Glutamic Acid in Brain Tissue. *Takagaki, Genkichi.* [*J. Biochem.*, **42**, 131 (1955).]

When homogenate of guinea-pig brain in Krebs-Ringer phosphate solution (200 mg./ml.) is incubated at 37°, NH₃ formation increases with time and is accompanied by a rapid decrease in glutamic acid (I) as well as a gradual increase in glutamine (II); at the same time, there is a decrease of adenylic acid compounds (III), which are determined spectrophotometrically at 260 mμ. Addition of (I) to the homogenate causes no appreciable rise in NH₃ production, but gives a considerable increase in (II). The spectrophotometric estimation at 260 mμ indicates a predominant deaminative NH₃ formation from (I), especially in the initial 10 minutes of reaction. On addition of 10⁻³ M nucleotides to the brain slice, yield of NH₃ is as follows: inosine triphosphate (ITP) ≫ control > adenosine monophosphate (AMP) ≫ inosine monophosphate (IMP); that of (II) is greater by AMP, control, IMP, ITP in order.

F. K. ANAN (Chem. Abstr.)

Phosphorylation in Brain Tissue in the Chick. *Gordon, O. M., et al.* [*Experientia*, **11**, 194 (1955).]

Suspensions of chick brain and liver were incubated with adenosinetriphosphate (I) and KH₂P³²O₄ in a Dubnoff metabolic shaker. After incubation the labelled components were separated chromatographically; measurements of radioactivity and spectrophotometric analyses were then effected, the data being expressed as counts/min./optical d. unit at 260 mμ. In all cases the specific activity of the (I) was less in brain than in liver. The difference between the rate of exchange in brain and in liver appears to be greater in the hatched chick than in the embryo incubated for 17 days.

D. S. FARNER (Chem. Abstr.)

Nucleic Acids and Phospholipides of the Rabbit Brain in Ontogenesis. Manukyan, K. G. [Doklady Akad. Nauk S.S.S.R., **101**, 1085 (1955).]

The content of nucleic acids and phospholipides in the rabbit brain in various stages of growth was determined. The results, which are shown graphically, indicate a gradual decline in the cerebral cortex of deoxyribonucleic acid, ribonucleic acid behaving similarly. In the cerebellum there is a mild rise of both components immediately after birth for some 15 days; in the medulla both components show a moderate decline with age, the spinal cord showing the same result. Phospholipides generally increase in concentration with age, although the cerebral cortex shows a sharp min. some 10 days after birth.

G. M. KOSOLAPOFF (Chem. Abstr.)

Phosphorus Metabolism in the Cortex of the Cerebrum in Dogs During Sleep and Wakefulness. Smirnov, A. A. [Doklady Akad. Nauk. S.S.S.R., **101**, 913 (1955).]

P metabolism in dog brain was followed by P^{32} tracing. The rate of P renewal and penetration of phosphates from the blood is 3-4 times greater for the cerebral cortex than for midbrain; the motor and visual zones are 1.5 times more active in this respect than the auditory zone. In sleep the rate of phosphate renewal and penetration drops by some 25 per cent., except for the auditory zone which is but little affected.

G. M. KOSOLAPOFF (Chem. Abstr.)

Study of the Rate of Exchange of Phosphorus in the Brain of Rabbit in Various Stages of Ontogenesis with the Aid of Radioactive Phosphorus. Smirnov, A. A., and Chetverikov, D. A. [Doklady Akad. Nauk. S.S.S.R., **90**, 631 (1953).]

P exchange was studied by intraperitoneal introduction of P^{32} after which in 12 hours the brain was examined after trepaning and freezing the specimens in dry ice. It was shown that P^{32} enters most rapidly the less complex acid-solution organic compounds of brain tissue, less rapidly it enters the P-containing proteins, while the least rate is found for phospholipides. The radioactivity of all fractions declines rapidly in the 1st weeks of postembryonic period of the animals. After 2 months of age the value remains nearly consistent with age. This is mainly caused by lesser exchange between the phosphates of blood and brain. The highest uptake of P^{32} occurs in medulla oblongata, other brain parts are similar to each other in this respect, in the acid solution and protein fractions. The medulla also shows the most rapid exchange of phosphates with the blood.

G. M. KOSOLAPOFF (Chem. Abstr.)

The Quantitative Determination of Some Metals in the Human Brain. Dorfman, S. I., and Shipitsyn, S. A. [Biokhimiya, **20**, 136 (1955).]

Samples of different parts of human brains of 50 persons who died of accidents and of certain somatic diseases were subjected to chemical analysis and the results evaluated statistically. Brain tissues were washed free from blood, weighed, dried to consistent weight, ashed, and tested for Pb, Cu, Si, Mn, Mg, Fe, and Ca. By means of a curve of concentrated distribution it was shown that the cortex of the cerebrum contained in mg. per cent. on the dry basis: Pb 0.16, Cu 2.7, Si 8.0, Ca 32, Mn 0.15, Fe 16, Mg 190; the cerebellum, Pb 0.25, Cu 2.8, Si 7.5, Ca 40, Mn 0.23, Fe 16, Mg 250; the hypophysis, Pb 1.5, Cu 3.4, Si 38, Ca 150, Mn 0.35, Fe 55, Mg 300. In the cerebral cortex values were practically the same for the pars posterior, central anterior convolution and the frontal pole.

B. S. LEVINE (Chem. Abstr.)

Coccarboxylase and the Excitability of the Nerve Centers. Di Stefano, E., and Previtera, L. [Boll. soc. ital. biol. sper., **30**, 1324 (1954).]

The excitement of the nerve centers which is produced by coccarboxylase may be associated with an action on the synthesis of acetylcholine.

FELIX SAUNDERS (Chem. Abstr.)

The Presence of Mucopolysaccharides in the Central Nervous System. Benassi, G. [Boll. soc. ital. biol. sper., **30**, 1258 (1954).]

Mucopolysaccharides and glycoproteins are found in central nervous system tissues.

FELIX SAUNDERS (Chem. Abstr.)

The Presence of Different Fractions of True Combined Creatine in the Central Nervous Substance. Mitolo, M., et al. [Boll. soc. ital. biol. sper., **30**, 1083 (1954).]

Creatine occurs in nervous tissue bound with phosphate and other substances.

FELIX SAUNDERS (Chem. Abstr.)

The Role of Water Metabolism Impairments in the Etiology of Some Neurologic Symptoms. Effect of Cortisone and of Posterior Hypophysis Extract. Haguenau, J., and Weil, B. [Bull. mem. soc. med. hop. Paris, **70**, 753 (1954).]

A patient with paresis, tendinous hyperreflexivity and positive Babinski test, had hemocentration, total blood proteins 88 g./l, albumin/globulin 1.6, plasma cyroscopy ΔT —0.60°, Na 158, K 5 meq./l and urinary 17-keto steroids 9.5 mg./day. Treatment with adrenocorticotrophic hormone (I), cortisone (II), and posterior hypophysis extract (III), suppressed

the dehydration, and the neurologic symptoms regressed. The plasmic hypotonia stopped the antidiuretic hormone secretion thus provoking salt retention, and increased the adrenocortical hormone output resulting in dehydration. (I) and (II) treatments partially improved the dehydration, but the weight increased only after including (III) in the treatment. The neurologic syndrome disappeared only after rehydration of the cerebral cells.

GEO. SAG (Chem. Abstr.)

Neurological Aspects of Industrial Intoxication from Manganese. Boyer, J., and Rodin, J. [Rev. neurol., **90**, 13 (1954).]

Chronic industrial poisoning from Mn produces disturbances of the central nervous system associated with endocrine and metabolic disorders. The electroencephalographic changes showed evidence of acute cortical atrophy. The histological findings are recorded.

H. W. GILLEN (Chem. Abstr.)

Phenylpyruvic Oligophrenia. Perrier, F. [Gaz. med. France (Paris), **56**, 873 (1949).]

In this disease, the amounts of phenylpyruvic acid in the urine are approximately inversely proportional to the mental age. There is hypopigmentation, probably connected with the same metabolic disturbance which produces phenylpyruvic acid. The enzyme chemistry of the liver and kidneys is disturbed.

W. C. TOBIE (Chem. Abstr.)

Somatic Aspects of Mental Health and Disease. Richter, D. [Brit. Med. Bull., **6**, 44 (1949).]

Biochemical, physiological, and neurological aspects are discussed, including the effects of hyperglycemia and anoxia.

W. C. TOBIE (Chem. Abstr.)

The Enteric Distribution of 5-hydroxytryptamine (Enteramine, Serotonin) in Some Large Domestic Mammals and the Appearance of 5-hydroxytryptamine and the Enterochromaffin Cell System in the Embryonic Calf. Faustini, Remo. [Am. J. Vet. Research, **16**, 397 (1955).]

This investigation of the occurrence and distribution of 5-hydroxytryptamine (I) in the gastrointestinal tract of farm animals confirms the thesis that (I) is the secretion or deposit product of the enterochromaffin cells and demonstrates that the substance circulates in fetal blood at least as early as in the 10th to 12th week of intrauterine life.

RUDOLPH SEIDEN (Chem. Abstr.)

Effects of Strychnine Application to the Ansiform Lobule on the Electric Activity of the Cerebral Cortex. Canestrari, Renzo, et al. [Atti accad. nazl. Lincei, Rend., Classe sci. fis., mat. e nat., **18**, 332 (1955).]

Application of paper disks of 5-mm. diameter soaked with a 1 per cent. strychnine nitrate solution to one ansiform lobule of the cerebellum produced in the dog a marked increase in the electrical potentials of the contralateral cerebral motor cortex. The increases in the ipsilateral cortex were less significant. The effects in the cat were similar but less consistent. Electrical stimulation of the same area of the neocortex caused stimulation of electrical waves over a wide area of the cerebrum, whereas the effect of strychnine applied only to circumscribed areas. The possibility is discussed that some neurons function with a transmitter other than acetylcholine, the cleavage of which is specifically inhibited by strychnine, whereas the electrical stimulation applies to neurons of both types of transmission.

A. E. MEYER (Chem. Abstr.)

Specific Changes in the Cerebellum in Chronic Mercuric Chloride Poisoning. Enders, A., and Noetzel, H. [Naunyn-Schmiedeberg's Arch. exptl. Pathol. Pharmacol., **225**, 346 (1955).]

Administration of 100 to 200 mg. HgCl₂ to rats over a period of various months causes specific neurological symptoms and Ca deposits in the cerebellum.

A. E. MEYER (Chem. Abstr.)

Mesomucnase and Brain Barrier. Ferrannini, A., and Mongelli Sciannameo, N. [Boll. soc. ital. biol. sper., **29**, 760 (1953).]

Mesomucnase was administered intravenously to guinea pigs, 2-300 units in 2-3 cc. This was followed by various ways of parenteral application by a number of dyes, and the passage into the cerebrospinal fluid and to the surface of the brain was observed. There was no evident influence on the permeability of the protective brain barrier.

A. E. MEYER (Chem. Abstr.)

Content of Water and Residual Nitrogen in the Brain of Animals Under Conditions of Block and Stimulation. Manoilova, O. S., and Bakulina, N. D. [Fiziol. Zhur. S.S.S.R., **41**, 262 (1955).]

Narcotics and sleep-producing substances lower the content of H₂O and residual N in

the brain of animals (white mice, rats, cats) the results being shown on simple bar graphs. Cardiazole increased H_2O and residual N content of the brain in the same animals.

G. M. KOSOLAPOFF (Chem. Abstr.)

Hematoencephalic Barrier. III. The Effect of Barrier on Drugs Acting on the Parasympathetic Nervous System, with Special References to Antibiotics. Kelentzi, B., and Foldes, I. [*Acta Physiol. Acad. Sci. Hung.*, **6**, 433 (1954).]

Acetylcholine (I) was injected intravenously into cats and rabbits followed by administration of penicillin (II). (II) appeared in cerebrospinal fluid in a concentration of 0.1–0.25 γ /ml. After simultaneous administration of physostigmine (III) and (I), the concentration of (II) in the cerebrospinal fluid reached much higher levels. Atropine had no effect on the permeability of the blood-brain barrier. Injection of streptomycin, chloramphenicol or Terramycin alone produced no demonstrable amounts in the brain or cerebrospinal fluid. After pretreatment with (I) and (III), each of these antibiotics could be detected.

HERMANN I. CHINN (Chem. Abstr.)

Carbohydrate Metabolism in Brain Disease. V. Effect of Adrenaline on Intermediary Carbohydrate Metabolism in Schizophrenic and Manic-depressive Psychoses. Henneman, Dorothy H., et al. [*Arch. Internal Med.*, **95**, 594 (1955).]

The carbohydrate metabolism after injection of adrenaline in doses of 0.01 mg./kg. body weight was studied in normal subjects, in patients with psychoses of recent onset, and in patients with chronic psychoses with and without previous lobotomy. The psychoses were schizophrenia and manic-depressive psychoses. The change in blood pyruvic, citric, and α -ketoglutaric acid concentrations were the same in all 3 groups of subjects. Rises in true blood glucose and lactic acid concentrations were normal in patients with psychoses of recent onset but were decreased in those patients with chronic psychoses who had not been lobotomized.

EDWARD J. VAN LOON (Chem. Abstr.)

Chemical Examination of Blood in Mentally Retarded Children. Hirsch, W., and Fischer, E. [*Harefuah*, **48**, 27 (1955).]

High carotene and low vitamin A values were found in hypothyroidism, cerebral palsy and certain cases of mental retardation not due to abnormally functioning thyroid gland. In malnutrition both carotene and vitamin A values were low or even absent. Deficient conversion of carotene to vitamin A may be due to liver damage, but the liver-function tests were normal.

A. S. MIRKIN (Chem. Abstr.)

Definite Identification of Choline in Cerebrospinal Fluid with Dipicrylamine by Preparative and Paper-chromatographic Methods. Ackermann, R., and Ackermann, D. [*Hoppe-Seyler's Z. physiol. Chem.*, **300**, 92 (1955).]

By precipitation with dipicrylamine 0.59 mg. choline was isolated/l. of cerebrospinal fluid. The derivative was identified by its m.p., by its m.p. in mixture with authentic derivative, and by paper chromatography of choline chloride.

ERICH HEFTMANN (Chem. Abstr.)

The Action of Lysergic Acid Diethylamide (LSD) on Mammalian Cholinesterases. Thompson, R. H. S., et al. [*Brit. J. Pharmacol.*, **10**, 61 (1955).]

(LSD) was a relatively powerful competitive, readily reversible inhibitor of pseudo-cholinesterase (I) in human serum and brain. True cholinesterase and tributyrinase of human brain were only slightly affected by concentrations of (LSD) which caused nearly complete inhibition of (I). (I) of rat, guinea pig, rabbit, chicken, and monkey brain were less sensitive to inhibition by (LSD) than (I) of human brain. (LSD) was a more powerful inhibitor of (I) than ergotoxine, ergotamine, dihydroergotamine, ergometrine, or methylergometrine.

RICHARD F. RILEY (Chem. Abstr.)

Production of Ethyl Alcohol Habituation. Fujita, Fujio. [*Folia Pharmacol. Japon.*, **50**, No. 3, 258 (1954).]

Cholinesterase activity in brain of normal rabbits and rabbits injected with 2 g./kg. alc. showed similar values, but the activity of rabbits habituated to alcohol by repeated administration for over 2 months showed a marked decrease (60 per cent.). Liver and blood serum cholinesterase activities showed similar results (40 per cent. and 50 per cent., respectively). In some cases these activities of the acutely intoxicated rabbit slightly increased. A discussion is given on the mechanism of alcohol habituation with reference to changes in enzymic systems.

SHOZABURO KITAOKA (Chem. Abstr.)

Arteriosclerotic Occlusion of Cerebral Arteries: Mechanism and Therapeutic Considerations. Bruetsch, Walter L. [*Circulation*, **9**, 909 (1955).]

The present concept of "cerebral thrombosis" may be incorrect, and a high cholesterol intake may not be the all-important causative factor. The cause of fibroplastic proliferation

in the atherosclerotic plaque may not be initiated by a lipide deposit. In some cases, the lipide seems to depress rather than stimulate the formation of connective tissue in the plaque.

THERESA SEVERN (Chem. Abstr.)

The Cerebrospinal Fluid Caramelization Test. Solé, A. [*Deut. med. Wochschr.*, **80**, 869 (1955).]

Spinal fluid (3-5 ml.) was autoclaved for 1 hour at 1.5 atm, and the glucose content was estimated qualitatively from the degree of browning. No caramelization was obtained at or below 40 mg. per cent. glucose. The test was used in the diagnosis of tuberculous meningitis in which low glucose values were observed.

JAMES C. MATHIES (Chem. Abstr.)

Cerebrospinal Fluid Following Oral Administration of Cortisone Acetate or Hydrocortisone.

Abelson, Denis, et al. [*J. Endocrinol.*, **12**, 87 (1955).]

No obvious differences in steroid pattern were found in cerebrospinal fluids obtained from patients with various neurological disorders. Fluids from similar patients up to 12 hours after oral administration of 200 mg. of either cortisone (I) acetate or hydrocortisone (II) were also examined. Extracts made from 50-100 ml. by modification of the method of Nelson and Samuels were subjected to paper chromatography by the system of Zaffaroni et al., with 3- and 60-hour chromatograms. In controls (I) and (II) were identified in concentrations of 0.1-0.2 and 0.2-0.4 γ per 100 ml., respectively. (I) was not increased by ingestion of either steroid; (II) was increased after both, though less after (I). Maximum increases in (II) were seen after 4.5 hours. Other unidentified compounds also appeared on chromatograms.

K. KNOWLTON (Chem. Abstr.)

Family Periodic Paralysis in a Mentally Deficient Boy. Couston, Thomas A. [*Arch. Disease Childhood*, **30**, 193 (1955).]

After epileptic attacks had been brought under control in a boy 16 years old, fits of flaccid paralysis continued. They were associated with plasm-serum K levels as low as 2.2 mg./l compared with his nonparalytic level of 4.5. They were ended by ingestion of K salts. Ingestion of large amounts of glucose produced only preliminary symptoms of these attacks, but the full syndrome appeared after 5 units of insulin were injected.

KATHRYN KNOWLTON (Chem. Abstr.)

Calcium and Magnesium in the Cerebrospinal Fluid. Harris, Wm. H., and Sonnenblick, Edmund H. [*Yale J. Biol. Med.*, **27**, 297 (1955).]

In a series of 40 patients with no signs of neurological, neurotic, or psychotic disorders, cerebrospinal fluid contained 4.95 ± 0.11 mg. Ca/100 cc. and 3.01 ± 0.06 mg. Mg/100 cc., with a ratio of 1.64 ± 0.03 . In 10 of these, serum Ca and Mg were also determined with a ratio of 4.1. A modification of the ethylenediaminetetraacetic acid procedure is described for the determination of Ca and Mg.

LEO LUTWAK (Chem. Abstr.)

Histochemistry of Cholinesterase. II. Distribution of Cholinesterase in the Central Nervous System. Toyota, Masateru. [*Nisshin Igaku*, **41**, 34 (1954).]

Distribution of cholinesterase (I) in the central nervous system of the dog was determined by the method of Koelle. Concentration of (I) was high in gray matter and low in white matter. Caudate nucleus, putamen, substantia nigra, and olivary body contained high concentrations of (I). (I) was found mainly in the cytoplasm of the cell. A little (I) was found also in myelinated nerve fibers.

TETSURO KONO (Chem. Abstr.)

Carbohydrate Metabolism of Normal Brain. Prokhorova, M. I. [*Uchenye Zapiski Leningrad, Gosudarst. Univ. im. A. A. Zhdanova*, No. 164, Ser. Biol. Nauk., No. 32, 362 (1954).]

Brain carbohydrate metabolism was studied by arteriovenous differences in sugar, lactic acid, and blood gases. Sugar, lactic acid, CO_2 , and O_2 of blood flowing to and from the upper longitudinal sinus, without excitation of the animal were carried out, from 2 months to over 2 years. Sugar content of arterial blood fluctuated from 56 to 101 mg. per cent., and was lower (45-86 mg. per cent.) in blood flowing away from the brain, the fluctuation being greater for the more excitable dogs. In the normal state, brain used 6.0-15.0 mg. sugar/100 ml. blood, average 8-9 mg./100 ml. blood. Sugar fluctuation was 5-12 mg. per cent. for short time intervals of 1-3 hours. The brain yielded 6.4 ml. CO_2 /100 ml. inflowing blood. Normal brain respiratory quotient (R.Q.) usually ranged from 0.50 to 1.25; the R.Q. approximated unity (average of 65 determinations). The wide range in R.Q. indicated that metabolism of compounds in the brain is a continuous process. Oxidizing processes of the brain over short intervals apparently occur at unequal intensities. Comparison of glucose and O_2 consumption with CO_2 indicated that most of the glucose is oxidized to CO_2 in the brain. Lactic acid values of blood for different dogs, particularly of the more excitable ones, fluctuated greatly; the arteriovenous difference was not consistent, amounting frequently to ± 1.0 mg. per cent., which could be due to experimental error. The brain at times retains, and then gives up, lactic acid. Variability of lactic acid metabolism in the brain can be attributed to variability in oxidation processes of brain tissue within given time intervals. O_2 consumption by dog

brain averaged 6.8 ml./100 ml. blood flowing through brain tissue, the CO_2 evolution being 6.4 ml., the R.Q. approximately 1. Comparison of glucose consumption by the brain with CO_2 evolution or retention of lactic acid, indicates that oxidizing processes account for not less than 80-90 per cent. of the carbohydrate consumption.

CLAYTON F. HOLOWAY (Chem. Abstr.)

The Feeding Center of the Hypothalamic Region of the Rat Brain. Forssberg, A., and Larsson, S. [*Experientia*, **11**, 158 (1955).]

Hungry rats (I) were injected intraperitoneally with 200 mg. $\text{Na}_2\text{H}^{32}\text{PO}_4$ at the end of a 24-hour hunger. Fed controls (II) were similarly treated. Animals were killed by plunging into liquid O 15-60 minutes after injection. The feeding center and 2 adjacent parts of the hypothalamus were prepared from frozen brain tissue; samples of cerebrum, blood, liver and muscles were taken for comparison of gross distribution in (I) and (II). The livers of (I) took up significantly more P^{32} than those of (II) whereas there were no significant differences between the muscles, cerebrum, and blood of (I) and (II). The feeding-center sample from (I) had more P^{32} than that from (II) whereas the opposite was true for the 2 adjacent parts. The distribution of adenosinetriphosphate and phosphocreatine combined was similar to that of P^{32} .

D. S. FARNER (Chem. Abstr.)

Metabolism of Acetylcholine. IV. Its Relation to Sulfhydryl Groups. Nakata, Fujio. [*Nisshin Igaku*, **41**, 43 (1954).]

Concentrations of SH groups in various organs of rat and dog were determined amperometrically. The concentration of SH groups showed no relation to that of cholinesterase or the ability of the organ to produce acetylcholine.

V. Effect of Copper Sulfate. [*Ibid.*, 78-80.]

When 100 mg. CuSO_4 was added to 2 ml. of diluted brain homogenate (diluted $\times 210$ for the determination of cholinesterase (I), $\times 3$ for SH groups (II), and $\times 13$ for acetylcholinesterase (III)), the amount of (I), was 41 per cent., (II) was 62 per cent., and (III) was 79 per cent. of that of the controls.

TESURO KONO (Chem. Abstr.)

Action of Thromboplastinase on Human Brain Lipide Fractions. Feldman, Donald and Ginell, Robert. [*Proc. Soc. Exptl. Biol. Med.*, **89**, 13 (1955).]

The action of the bacterial thromboplastinase previously described on thromboplastically active lipid material is described. In all cases, loss in clotting potency was accompanied by a liberation of acid solution organic phosphate. An unidentified P compound was isolated from the reaction mixture after thromboplastinase action.

L. E. GILSON (Chem. Abstr.)

Experimental Psychosis Elicited by Lysergic Acid Diethylamide. Roubíček, Jiří and Srnec, Jan. [*Časopis Lékařu Ceskyh*, **94**, 189 (1955).]

Lysergic acid diethylamide (I) was administered to 12 normal subjects. The picture was dominated by sensory aberrations, hypomanic behavior, and vegetative amphotony. Somatopsychic depersonalization occurred; K level increased slightly, glycemia showed no change, cephalincholesterol test was negative. The sensitivity of psychotic patients (30 cases) to (I) was somewhat decreased. (I) appears to cause a manifestation of latent symptoms. No lasting improvement was noted in depressive states. Electroencephalograms (EEG) were characterized by an acceleration of the α -rhythm (in 27 of 31 previously normal EEG) and by an increase of amplitude of the β -waves. Both diencephalon and cerebral cortex seem to be affected by (I).

I. M. HAIS (Chem. Abstr.)

Some Effects of the Peripheral Field on the Cytochemical Differentiation of Neurons. Mottet, Karle and Barron, Donald H. [*Yale J. Biol. and Med.*, **26**, 275 (1954).]

The right posterior limb bud and adjacent tissue were removed from 70 chick embryos before 3 days' incubation leaving the left side unoperated as control. Nuclear deoxyribonucleic acid (I), measured by Feulgen staining, was diminished on the control sides in spinal cord cells differentiating into neurons, while cytoplasmic ribonucleic acid (II), measured by Nissl staining, and acid phosphatase (III), demonstrated by Gomori staining, became more intense. These cytochemical changes paralleled the morphological. On the operated side, the anterior horn and spinal ganglion cells that normally differentiate into motor and sensory neurons remained cytochemically indistinguishable from indifferent cells. Thus, the concentration of (I), (II), and (III) was shown to be affected by the peripheral field.

LEO LUTWAK (Chem. Abstr.)

*Preliminary Studies on the Hormones of the Brain and of the Postcerebral Complex of the Phasmes, *Carausius morosus* and *Cuniculina cuniculina*.* L'Hélias, Colette. [*Compt. rend.*, **240**, 1141 (1955).]

Brains (I) of phasmes were subjected to paper electrophoresis. At pH 7.4, (I) gave a band which provoked darkening in an animal deprived of the corpora cardiaca (II). (II) at

this pH yielded a more mobile compound which did not cause darkening. The corpora allata (III) gave a band analogous to that of (I) but which led to less darkening. At pH 3.2, (II) gave a band leading to darkening and essentially identical to the hormone of (I). Injections of extractions of (I), (II), and (III) at pH 3.2 provoked melanization in animals without (II). In normal animals, or those without (III), such injections led to the development of an orange color. The (II) appeared to have an inhibitory role on the last stage of melanization. The hormone of (II) was a thermostable substance that did not dialyze through collodion membranes. Smaller, dialyzable compounds with hormone activity were present in the extractions. Under a fluorescence microscope, various areas of the (I) of *C. cuniculina*, after ultraviolet irradiation at pH 3.2, showed a blue fluorescence characteristic of pteridines and which did not appear in H_2O , MeOH, or HOAc. The injection of synthetic pteroylglutamic acid (IV) into these animals gave the same results as that of eluates from the electrophoresis of (I). Eluates of (I), (II) and (III) stimulated the growth of *Lactobacillus casei* as did (IV).

LEO LUTWAK (Chem. Abstr.)

Cholinesterase Activity of Cerebrospinal Fluid. Jefferson, Michael. [Clin. Sci., 13, 599 (1954).]

When the protein content of spinal fluid is abnormally high, pseudocholinesterase activity is increased, probably related to the rise in the globulin component. True cholinesterase activity may decrease with high spinal fluid protein levels. There is a significant correlation between spinal fluid protein and the ratio: true/pseudo cholinesterase activity.

BERNARD KLEIN (Chem. Abstr.)

Effect of Niacin Avitaminosis on Conditioned Reflexes in Dogs. Efremov, V. V., et al. [Voprosy Pitaniya, 13, No. 3, 10 (1954).]

In dogs fed a niacin (I)- and tryptophan (II)-deficient diet (a corn diet containing some (II)-free casein hydrolyzates) the amount of N-methylnicotinamide (III) excreted with the urine decreased from 6-12 (control) to 1.2-0.2 mg./day. During the restoring therapy (addition of (I) to the diet) the amount of the (III) excreted increased rapidly. The amounts of dipyrindine nucleotides (IV) and proteins in blood did not change significantly (9-14 γ and 7.5-6.8 g./100 ml. blood, respectively) during the experiment. The normal wt. was restored and the amount of (IV) in blood was increased (up to 20 γ /100 ml. blood) after the experimental dogs have received a 50-mg. dose of (I). The avitaminosis was developed within 50-60 days of the feeding. During the avitaminosis the conditional reflexes were rapidly distorted: the disturbance of the higher nervous system (cerebral cortex) occurs much sooner than the appearance of the clinical symptoms of the avitaminosis.

E. WIERBICKI (Chem. Abstr.)

Effect of Potassium Ion on Brain Slices. Tsukada, Yazuzo and Takagaki, Genkichiro. [Nature, 175, 752 (1955).]

The effects were determined of various substrates and inhibitors on the alterations of the metabolism of guinea-pig cortex slices induced by an increased KCl concentration. The O_2 consumption (I) of the slices was determined manometrically in Krebs-Ringer at 37°. Dilution of Na ion to less than 15 millimoles by the addition of choline prevented the usual increase of (I) caused by 50 millimoles KCl (the K effect). A Na-free solution also caused a 3-fold increase in anaerobic lactate production (II), relatively independently of the K concentration. 2,4-Dinitrophenol (KNP) $5 \times 10^{-5}M$ increased (I) even in Na-free solutions, whether the substrate was glucose or pyruvate at 10 millimoles. With the latter substrate, the (II) was slight and not increased by high K or (DNP). Malonate (III) at 10 millimoles prevented the K effect whether pyruvate 1, lactate 5, or glucose 10 millimoles served as substrate. Fumarate or oxalacetate reversed this inhibition of the K effect by (III). In normal K concentrations, although the (III) did not greatly affect (I) or (II), it markedly reduced the glucose consumption. High K solutions increase (I), (II), and substrate consumption. The addition of (III) further increases (II), but (I) and substrate consumption are reduced toward normal values. (III) also partially prevented the decrease of phosphocreatine caused by high K, even though (III) alone had no effect on the phosphocreatine. Fluorocitrate and Na azide partially prevented the K effect on (I). The authors conclude the K ion may affect 2 enzymic points: the glycolytic system and the pyruvate oxidation system, probably the condensing enzyme.

H. P. J. (Chem. Abstr.)

Stimulation of Secretion of Oxytocin by the Hypothalamus by the Application of Adrenaline to the Cerebral Cortex. Chamorro, Antonio and Minz, Bruno. [Compte. rend., 240, 1368 (1955).]

Application of adrenaline to the frontoparietal region of the cerebral cortex of female rabbits (previously treated with subcutaneous estradiol benzoate) provoked secretion of oxytocin by the hypothalamus as indicated by uterine contraction. Oxytocin seemed to originate in the posterior hypothalamus and vasopressin in the anterior hypothalamus; this indicates a possible dual function of a single region of the cerebral cortex.

VERA C. GLOCKLIN (Chem. Abstr.)

Movements of Cations During Recovery in Nerve. Hodgkin, A. L., and Keynes, R. D. [*Symposia Soc. Exptl. Biol.*, **8**, *Active Transport and Secretion*, 423 (1954).]

At each impulse a stimulated nerve gains Na and loses K. Following stimulation Na is slowly excreted from squid axons. Tracer experiments show a nearly equal flux of Na in and out of the axon. The secretory work is about 10 per cent. of the resting O consumption. Dinitrophenol (DNP) reduces Na efflux almost to zero. Cyanide and azide have similar effects. (DNP) has a negligible effect on the excitability membrane potentials and Na influx of stimulated squid axons confirming the theory that Na movement into the nerve during excitation is passive and the result of flow along existing ion gradients. Na efflux is reduced to one-third in K-free media but is unchanged by polarization currents which increase the membrane potential by 28 mv. Na efflux is slightly increased in an ion-free isotonic media but is still blocked by (DNP). A part of the K influx into nerves after stimulation is active and may be coupled with Na secretion.

ROBERT B. DEAN (Chem. Abstr.)

Visceral Functions of the Nervous System. Burn, J. H. [*Ann. Rev. Physiol.*, **17**, 293 (1955).]

The review covers hypothalamic and posterior lobe extracts, paraventricular nucleus and oxytocin, release of hormones from the pituitary, the pituitary and renal circulation, function of pseudocholinesterase, cholinesterase in glial tumors, sympathin in the brain, action of acetylcholine on Na transport, acetylcholine as a local hormone, transmission of sensory impulses, the function of 5-hydroxysecretion, effect of adrenaline on ganglion cells, gastric secretion, substances causing pain, blood histamine and the adrenals, histamine liberation and lymphagogue action, gastrin as a histamine liberator, histamine inhibitors, and amine oxidase. Eighty-eight references.

RACHEL BROWN (Chem. Abstr.)

Conduction and Transmission of the Nervous System. Crescitelli, Frederick (Univ. of California, Los Angeles). [*Ann. Rev. Physiol.*, **17**, 243 (1955).]

Researches employing the technique of intracellular recording with microelectrodes are featured in this review. One hundred and sixty-three references.

RACHEL BROWN (Chem. Abstr.)

Influence of Exogenous Hormones on the Acetylcholine Content of the Middle Hypothalamus in Rats. II. The Effect of Adrenocorticotrophic Hormone (ACTH), Deoxycorticosterone Acetate (DOCA), Adrenosuprenal Extract, and the Adrenosuprenal on the Diencephalic Acetylcholine Content. Gitsch, E., and Reitingier, J. [*Zentr. Gynakol.*, **75**, 373 (1953).]

Adrenalectomy has no effect on the acetylcholine content of the region of the tuber cinereum in female rats. In intact female rats (ACTH) and adrenosuprenal extract cause an increase in acetylcholine content; (DOCA), however, does not cause an increase comparable to that of (ACTH) or adrenosuprenal extract. The increase observed 4 weeks after ovariectomy is not due to adrenosuprenal activity.

R. D. H. (Chem. Abstr.)

Effect of Controlled Hypotension on Cerebral Function and Circulation. Saunders, J. W. [*Lancet*, **266**, 1156 (1954).]

Hypotension was produced by hexamethonium bromide and pneumatic suction applied to the legs. The arterio-venous O difference (4.8 vol. per cent.) was less than normal and the estimated cerebral blood flow (46.9 ml./100 g. brain/min.) was about normal. Cerebral blood flow and oxygenation remain adequate during hypotension when the patient is kept horizontal or nearly so if the systolic pressure does not fall below 55-60 mm. Hg.

BARBARA MURRAY (Chem. Abstr.)

Cupremia in Nervous System Diseases. Hammerschmidt, R. Violeta. [*Anales fac. farm. y bioquim.*, Univ. nacl. mayor San Marcos, **4**, 224 (1953).]

The blood Cu level was raised in chorea, athetosis, post-encephalitic parkinsonism, and parkinsonian syndrome.

ALFREDO LEVY (Chem. Abstr.)

Pyruvemia in Experimental Pigeon Polyneuritis. Chiong Ch, Rosa. [*Anales fac. farm. y bioquim.*, Univ. nacl. mayor San Marcos, **4**, 215 (1953).]

Polyneuritis raises the pyruvic acid (I) blood level in pigeons, while with healing it returns to normal. The normal blood level of (I) is 1.72 mg./100 g. in male pigeons, and 1.42 mg./100 g. in females.

ALFREDO LEVY (Chem. Abstr.)

Composition of Brain Pentosenucleic Acid in Normal and Poliomyelitis Virus-infected Mice. Siegel, Benjamin V., and Kuusi, Taina K. [*Proc. Soc. Exptl. Biol. Med.*, **89**, 305 (1955).]

Two different methods of hydrolysis and chromatography were applied to isolated and purified pentosenucleic acid preparations from brains of control mice and mice inoculated

intracerebrally with poliomyelitis virus MEF₁ strain (Type 2) for study of the purine and pyrimidine compound. A small but apparently significant increase in uracil content was observed in the preparations from infected mice; that showed paralytic symptoms of central nervous system involvement.

L. E. GILSON (Chem. Abstr.)

Hematological Changes in the Course of Multiple Sclerosis. Persson, I. [*Nord. Med.*, **49**, 646 (1953).]

In a young patient the fibrinogen content of the plasma was high (maximum 450 mg./100 ml.) in relation to the sedimentation rate (10 mm. and less) during 2 periods of disease activity; the number of thrombocytes was decreased. Addition of cerebrospinal fluid caused agglutination of the thrombocytes. These biochemical changes are believed to support the theory of thrombosis as the cause of plaque formation.

P. M. B. (Chem. Abstr.)

The Constitution of the Highly Unsaturated C₂₀ and C₂₂ Fatty Acids of Brain Glycerophosphatides. Klenk, E., and Bongard, W. [*Congr. intern. biochim., Résumés communs.*, 2^e Congr., Paris, 1952, 160-1 (in English).]

Commentary on the data of another paper. All unsaturated C₂₀ and C₂₂ fatty acids of brain phosphatides have the 1st double bond from the terminal Me group in the same position as in oleic, linoleic, and linolenic acids.

W. C. TOBIE (Chem. Abstr.)

The Effect of Mental Arithmetic on Cerebral Circulation and Metabolism. Sokoloff, Louis, et al. [*J. Clin. Invest.*, **34**, 1101 (1955).]

Studies of cerebral circulation and metabolism at rest and during the mental exertion required in solving problems in arithmetic were made in 13 university students and faculty members. There were no changes in cerebral blood flow, cerebral O consumption, cerebral vascular resistance, and cerebral respiratory quotient from the control levels during the performance of mental arithmetic. Except for a slight increase in arterial O content, mental arithmetic was not accompanied by any change in the blood O concentration, CO₂ tension, pH, or arterial hemoglobin concentration. Comparison of the subjects in the mental arithmetic study and an independent group of normal controls revealed significantly higher cerebral blood flow and O consumption.

JOHN T. MYERS (Chem. Abstr.)

The Effects of Sleep and Lack of Sleep on the Cerebral Circulation and Metabolism of Normal Young Men. Mangold, Renward, et al. [*J. Clin. Invest.*, **34**, 1092 (1955).]

Studies of cerebral blood flow, cerebral vascular resistance, cerebral O consumption, blood gases, hemoglobin concentration, and blood pH were made. The mean values for the rested subjects were almost identical with normal values previously reported for the method. Fatigued subjects showed no differences from the resting controls except for an elevation in cerebral blood flow. During natural sleep there were no changes in cerebral O consumption, blood hemoglobin concentration, and arterial O content. The fatigued subjects who slept were distinguished from those unable to sleep by higher values in CO₂ tension and lower values of pH in arterial and cerebral venous blood even during the control period. These findings suggest some relation between respiratory acidosis and the process of falling asleep.

JOHN T. MYERS (Chem. Abstr.)

A Mucopolysaccharide from Human Cerebral Cortex. Ejima, Tatsunori. [*Tohoku J. Exptl. Med.*, **61**, 163 (1955).]

The mucopolysaccharide was extracted with 23 volumes NaCl from 6 minced, dried, defatted cerebral cortices. Impurities were removed by precipitation at pH 1.5 with HCl and at 4.2 with AcOH, at pH 5.6 with 20 per cent. Ba(OAc)₂, at pH 9.0 with Ba(OH)₂, at pH 5.8 by saturation with (NH₄)₂SO₄, and at pH 5.6 with 10 per cent. Pb(OAc)₂. The mucopolysaccharide was precipitated with 10 volumes EtOH, yielding 126 mg. After hydrolysis, a paper chromatogram showed spots corresponding to chondrosamine, glucosamine, and galactose and weak spots corresponding to mannose and L-fucose. The optical rotation in water was (α)_D²⁰ = -31.9°. A N-glycoside linkage is probable. It had no blood group activity.

M. HETRICK (Chem. Abstr.)

III. The Effect of Androgen, Chorionic Gonadotropin, and Arterenol on the Diencephalic Acetylcholine Content. [*Ibid.*, 734.]

In intact as well as in ovariectomized rat testosterone propionate causes an increase in the diencephalic acetylcholine content. Chorionic gonadotropin has no effect in ovariectomized animals. Arterenol has no effect in intact females, but does cause a decrease in ovariectomized animals. Through *Excerpta Med., Sect. III*, **8**, 120 (1954).

R. D. H. (Chem. Abstr.)

Morphological Changes in the Motor Cells of the Anterior Cornu of Frogs and Toads After Application of Trypaflavine. Wehling, Harald. [Z. Zellforsch. u. mikroskop. Anat., **36**, 171 (1951); Chem. Zentr., **11**, 3340-1 (1951).]

A study was made on the motor anterior cornu cells of the frog and toad to determine the effect of trypaflavine (I) on the plasma nucleotides and the cell organelles concerned in their formation. From 0.4 to 30 mg. of a 1-2 per cent. solution of (I) was injected into the dorsal lymph sac of the animals. The motor ganglion cells of the spinal cord, which were high in plasma nucleotides and no longer able to undergo division, showed changes which are regarded as indicating interference with the ribonucleotide metabolism. Characteristic changes observed were the simultaneous appearance of nucleolus variations in form, size, and number; the formation of nuclear capsules; variability of the nuclei as to form, size, and position; and changes in the tigroid substance. Changes in the Nissl substance were much more difficult to establish than those in the nucleolar apparatus. Corresponding deviations from normal could also be produced by electrical stimulation. In the (I) experiments the results varied with time and dosage. The probable point of attack of (I) on the nucleotides of the nucleus and of the plasma is discussed.

M. G. MOORE (Chem. Abstr.)

Metabolic Disturbances in Wilson Disease. Gilsanz, V., et al. [Arch. med. exptl. (Madrid), **17**, 247 (1954).]

The effects of BAL and ACTH on Cu excretion, NH_3 production, and amino acid excretion by the kidney and plasma phosphatases before and after vitamin D administration were studied in 2 cases of Wilson's disease (hepatolenticular degeneration), and in 3 normal relatives of these patients. NH_3 production and alkaline phosphatase are increased in the disease; vitamin D does not affect alkaline phosphatase. Cu excretion is unaffected by ACTH although amino-aciduria increases. BAL affects Cu excretion but not amino acids. It is suggested that Cu excretion is not associated with amino acid excretion.

L. A. SAPIRSTEIN (Chem. Abstr.)

Nadi Reaction in the Substance of the Central Nervous System. Mitolo, M., and Ruccia, D. [Arch. sci. biol., **39**, 132 (1955).]

In the brain substance of the rat with blocked cytochrome oxidase activity, which is effected by treating the brain pulp with a 5 per cent. aqueous solution of Me_2CO for 45 minutes at 45° , it is still possible to obtain a positive Nadi reaction (synthesis of blue indophenol catalyzed by a nonenzymic process from α -naphthol and p-phenylene-diamine at pH 11 and $22-8^\circ$). This indophenol reaction is not obtained with the $\text{H}_2\text{O-Me}_2\text{CO}$ extract containing fractions of free cholesterol and parts of the phosphatides and unsaturated cerebrosides, nervone and hydroxynervone. The $\text{H}_2\text{O-Me}_2\text{CO}$ extract contains substances inhibiting the Nadi reaction. A $\text{H}_2\text{O-pyridine}$ extract of the pre-extracted or fresh material is Nadi-positive. The reaction seems to be bound to the saturated cerebrosides. Extraction with pyridine of the unextracted material gives a weaker positive extract than the pre-extracted pulp, proving the interference by an inhibitor.

A. E. MEYER (Chem. Abstr.)

Relation Between Diencephalon and Carbohydrate Metabolism. Changes in Blood Sugar Caused in Normal Persons by Administration of Lipide Fraction from Diencephalic Nuclei. Fedeli, S., et al. [Arch. sci. med., **99**, 357-76 (1955).]

Persons treated for 15 days with a lipide fraction from hypothalamic nuclei (com. preparation of undeclared strength) at a dose of 2 cc. injected intravenously or intramuscularly showed uniformly a gain in body weight and a decrease in carbohydrate and insulin tolerance.

A. E. MEYER (Chem. Abstr.)

Behavior of Rabbit Brain (EEG Observations) in Ischemia and Anoxia After Adaptation for Altitude. Opitz, E., and Kreuzer, F. [Pflügers Arch. ges. Physiol., **260**, 480 (1955).]

The electroencephalogram of unanesthetized rabbits was recorded during acute ischemia or anoxia and during the recovery periods. These recordings were made before and after adaptation for altitude. When rabbits were kept in a low-pressure chamber at an equivalent altitude of 7,500 m. for 1-2 months, their hemoglobin increased to about 200 per cent. of the control level and their time of symptoms of ischemia to 160 per cent. and of symptoms of anoxia to 180 per cent. of the control values. Ten minutes in 6.5-7 per cent. O (equivalent to 7,500-m. altitude) reduced the time of onset of symptoms of ischemia or anoxia. When the hemoglobin level of the adapted animals was reduced by bleeding to the control hemoglobin level, the animals reacted to ischemia or anoxia as unadapted animals. It is concluded that the adaptation with regard to ischemia could be attributed to aerobic factors, but with regard to anoxia some anaerobic factors might be involved.

S. ELLIS (Chem. Abstr.)

Pantothenic Acid Deficiency Induced in Human Subjects. Bean, William B., et al. [J. Clin. Invest., **34**, 1073 (1955).]

Subjects on a diet devoid of pantothenic acid, and with an antagonist β -methylpantothenic

acid developed: (1) a neuromotor disorder; (2) cardiovascular instability especially in the upright position; (3) complaints referable to the alimentary canal; (4) repeated infections; and (5) physical and mental depression. They were not all relieved promptly by adding pantothenic acid to the diet. The biochemical changes included a fall in acetylation, carbohydrate metabolism, blood cholesterol esters, and steroid hormone excretion, and failure of adrenocorticotrophic hormone to induce eosinopenia. Individual variations were large.

JOHN T. MYERS (Chem. Abstr.)

Technique for Demonstrating Neurosecretory Material in the Human Hypothalamus. Adams, C. W. M., and Sloper, J. C. [*Lancet*, **268**, 651 (1955).]

The method devised is applicable to paraffin-embedded formalin-fixed tissue and involves oxidation of tissues by performic acid and subsequent demonstration of sulfonate radicals derived from cystine or cysteine with Alcian Blue at pH 2.0. The reaction is intensified if the section is first immersed in a reducing agent such as Na hydrosulfite. In 5 humans and animals including the dog, material through the neurohypophysis and in the supraoptic nuclei was stained a bright blue, indicating a high content of cystine or cysteine. This material may be considered posterior pituitary hormone; its histochemical localization in the human hypothalamus confirms the hypothesis that these hormones are elaborated in the hypothalamus.

BARBARA MURRAY (Chem. Abstr.)

Glucolysis in the Brain. Lenti, C., and Bargoni, N. [*Boll. soc. ital. biol. sper.*, **31**, 60 (1955).]

Acetylglucosamine, xylose, lyxose, glucose-6-phosphate, and extracts of nerve or placenta do not inhibit the anaerobic glucolysis of a suspension of brain in which glucose is the substrate. Adenosinediphosphate is also without effect on the glucolysis.

FELIX SAUNDERS (Chem. Abstr.)

Anaerobic Inhibition and Reactivation of Glucolysis in the Brain. Lenti, C., and Bargoni, N. [*Boll. soc. ital. biol. sper.*, **31**, 56 (1955).]

Addition of monoiodoacetate, iodoacetamide, p-chloromercuribenzoate, and o-iodosobenzoate abolish the formation of lactic acid in an extract of brain homogenate. Ascorbic acid partially abolishes the anaerobic inhibition of glucolysis produced by o-iodosobenzoate, 2,3-Dimercaptopropanol and glutathione (especially the former) reactivate the process inhibited by p-chloromercuribenzoate. Lactic acid formation is inhibited by ethylenediaminetetraacetate and the effect is overcome by the addition of Mg.

FELIX SAUNDERS (Chem. Abstr.)

Phenylketonuria. IV. Serum Proteins in Phenylketonuria. Brown, Douglas M., et al. [*Proc. Soc. Exptl. Biol. Med.*, **89**, 367 (1955).]

The greatly increased blood levels of phenylalanine that occur in phenylketonuria do not cause a significant quantitative alteration of the serum electrophoretic pattern from normal. Occasional serums of children with phenylketonuria contain abnormal β -globulins. These abnormalities disappear when the children are fed phenylalanine-low diets and the blood phenylalanine is lowered to normal. There appears to be no correlation between the presence of the abnormal β -globulins and the degree of mental impairment. Possibly the abnormal globulins are manifestations of slight liver dysfunction.

L. E. GILSON (Chem. Abstr.)

Metabolism of Nucleoside and Nucleotide Purines in Brain Homogenate. Orunesu, M., et al. [*Giorn. biochim.*, **3**, 183 (1954).]

In experiments on the degradation of adenylic acid (I) (0.003 M 1 cc., in veronal-acetate buffer 0.14 M 2 cc.) by brain homogenate (1:20 1 cc.), total pentose and ribose 5-phosphate (II) disappeared, respectively, by 0.09–0.48 and 0.57–3.0 micromoles within 3–30 minutes without further decrease (for liver homogenate these figures were 0.55–2.14 and 2.20–3.0 within 3–60 and 3–12 minutes respectively). In degradation of (II) the above figures were 0.18–1.80 and 0.33–2.40 within 3–60 minutes for brain, and 1.76–2.34 and 2.10–3.0 micromoles within 3–12 and 3–30 minutes respectively for liver. Further additions of substrate in (I) degradation tests showed the total pentose disappearance to continue at the same rate; this agreed perfectly with the disappearance of purine-ribose. In degradation experiments on guanosine, adenosine, and inosinic acid (conditions as above), the total pentose and the purine-ribose disappearances were, respectively 0.50–0.96 and 1.05–1.72, 0.0 and 0.0–1, and 0.55–1.22 and 0.96–1.59 micromoles within 15–60 minutes. It is concluded that the cessation of adenylic acid degradation by brain homogenate after the first 30 minutes of incubation is not due to enzyme exhaustion but to absence of adenosine deaminase in the brain tissue, and the degradation itself is due to the presence of a deaminase of adenylic acid which transforms it to inosinic acid (normally degraded by brain).

C. SCANDURA (Chem. Abstr.)

Action of Acetylcholine, Eserine, and Atropine on the Isolated Gyrus of the Cerebral Cortex of the Cat. Infantellina, F. [*Arch. sci. biol.*, **39**, 209 (1955).]

The local application of 1 per cent. eserine solution followed by 1 per cent. acetylcholine solution to the gyrus free of spontaneous pulsations causes the appearance of an intensive

rhythmic electric activity, which in some cases lasts for 1 hour. Application of eserine or acetylcholine alone causes a change of the response of the preparation to electric stimulation but does not cause spontaneous discharges. Injection into the carotid of 0.01-0.2 γ acetylcholine causes the appearance of spontaneous activity. Treating the gyrus with 0.2 to 1 per cent. solution of atropine causes inhibition of the cortical effects of eserine and acetylcholine applied locally.

A. E. MEYER (Chem. Abstr.)

Cytochemical Study on the Nerve Cells of the Anterior Horn of the Spinal Cord. Tagawa, Takasuke. [Kyushu Mem. Med. Sci., 5, 149 (1955).]

Nerve cells nontreated or treated with 10 per cent. salt solution, 10 per cent. perchloric acid, and 5 per cent. trichloroacetic acid were stained with hematoxylineosin or toluidine blue. The nucleolus and Nissl's bodies after treatment became acidophilic and stained with eosin. Changes in the ultraviolet light absorption of chromatin following treatment corresponded for the most part to those in the Feulgen reaction.

M. J. C. (Chem. Abstr.)

The Mechanism of the Potassium Loss from Brain Slices Induced by Cholinesterase Inhibitors. Strickland, K. P., and Thompson, R. H. S. [Biochem. J., 60, 468 (1955).]

The anticholinesterases diisopropyl phosphorofluoride (DFP), eserine, and N-(p-chlorophenyl)-N-methylcarbamate of m-hydroxyphenyltrimethylammonium bromide (Nu 1250), when present in concentrations of $2 \times 10^{-2}M$, $2 \times 10^{-2}M$, and $2 \times 10^{-4}M$, respectively, cause a loss of K from respiring brain slices. The loss of K does not correlate with the anticholinesterase properties of these inhibitors, since a virtually complete inhibition of cholinesterase in the slices occurred with concentrations of DFP, eserine, and Nu 1250 that were, respectively, 1/200, 1/200, 1/20 of those concentrations just capable of causing K loss. It seems that the permeability of the nerve cell to K is dependent on the energy-producing reactions of the cell rather than on the presence of an active acetylcholine-cholinesterase system.

ROLAND F. BEERS, JR. (Chem. Abstr.)

Depression in Brain Potassium in Ovine Pregnancy Toxemia. Setchell, B. P., and McClymont, G. L. [Nature, 175, 998 (1955).]

The mean K content of brain slices from pregnancy toxemia cases was significantly lower than that of normal brains, and that of the brains of insulinized sheep significantly lower than that of either of the other 2 groups. The association of a lower brain K in both pregnancy toxemia and prolonged insulin hypoglycemia is consistent with the hypothesis identifying ovine pregnancy as a hypoglycemic encephalopathy. The more marked depression of brain K in insulinized sheep reflects the more marked hypoglycemia seen in these sheep compared with developing pregnancy toxemia cases.

A. E. TEERI (Chem. Abstr.)

Metabolic Disorders in Head Injury. Survey of 76 Consecutive Cases. Higgins, G., et. al. [Lancet, 266, 61 (1954).]

Only 11 per cent. of 76 patients who were unconscious for more than 12 hours remained biochemically normal. Fifty patients exhibited one or more transient metabolic disorders (including proteinuria, hyperglycemia, renal glycosuria, raised blood urea level, and low total plasma-protein levels). Eighteen persons developed major metabolic changes which were persistent and progressive unless reversed by specific treatment. These included hyperchloremia-hypochloruria, hypochloremia-hyperchloremia, water deprivation, respiratory alkalosis, and renal uremia.

BARBARA R. MURRAY (Chem. Abstr.)

Study and Documentation of the Neurocrinia of the Hypothalamohypophyseal System With the Latest Methods. Stigliani, R., and Monaci, M. [Arch. "De Vecchi" anat. patol., 17, 655 (1952).]

A study of the principal findings regarding the relation between hypothalamus and hypophysis, with reference to the problem of secretion. Attention is drawn to the fact that even now there is no reliable information as to the origin of this secretion. The study of the hypophysis and hypothalamus of dogs, guinea pigs, and rats revealed: (1) presence of colloid substance (pos. McManus test) in the anterior lobe and pars intermedia, inconstantly present or absent in the diencephalic nuclei; difference in color of the colloid substance in the hypophysis and hypothalamus; (2) intense production of proteins in the cells of the anterior lobe and in the ganglion cells of the subthalamic nuclei; (3) alkaline phosphatase activity of the cells of the anterior lobe and the subthalamic nuclei; (4) presence of abundant quantities of Gomori-pos. substance in the neurohypophysis and in the cells of the subthalamic nuclei, also demonstrable along the axons; (5) particular topographical relations between the cells of the subthalamic nuclei containing few neuro-endocrine granules and the blood capillaries, with features indicative of processes of hemocrinia. In view of the morphological findings the ganglion cells of the subthalamic nuclei are regarded as neuro-endocrine cells with an increased synthetic activity. In addition, it is believed that part of the secretion may be solely hypothalamic, although the possibility of a hypophyseal secretion, reaching the subthalamic

centers as a stimulus to or regulating mechanism of the activity of the latter, is not excluded as the hypothalamus and hypophysis were found to constitute a definite functional entity.

R. D. H. (Chem. Abstr.)

2. Pharmacology and Treatment

Chlorpromazine and the Autonomic Nervous System. Jourdan, F., et al. [Arch. intern. pharmacodynamie, **101**, 253 (1955).]

In dogs and rabbits, 5 mg./kg. chlorpromazine (4560 RP) causes hypotension and decreases or reverses adrenaline hypertension. It increases the heart rate, both in the denervated heart and after adrenaline. It has little effect on sympathetic stimulation, and at first decreases and then increases the effect of stimulation of the vagus. The hypotension is of central origin.

M. L. C. BERNHEIM (Chem. Abstr.)

Dual Mechanism of Antiemetic Action of Chlorpromazine in Dogs. Glaviano, Vincent V., and Wang, S. C. [J. Pharmacol. Exptl. Therap., **114**, 358 (1955).]

Chlorpromazine (I) in subcutaneous doses of 2 mg./kg. is effective in dogs in raising the threshold of emesis induced by apomorphine or hydergin approx. 10-fold. With this dosage, the oral dose of CuSO₂ required to evoke vomiting is not appreciably increased. The experimental findings suggest that the primary mechanism of the antiemetic property of (I) is a selective action on the chemoceptive emetic trigger zone, possibly by competitive affinity for receptors at this site. The more potent antiemetic effect of larger doses of (I) stems also from its depression of the reticular vomiting mechanism. (I) affords only moderate protection against vomiting induced by morphine and is not at all effective against that induced by lanatoside C, although these emetic agents act specifically through the trigger mechanism.

L. E. GILSON (Chem. Abstr.)

Chlorpromazine and the Adrenaline-secretory Centers. Donnet, V., et al. [Compt. rend. soc. biol., **148**, 2033 (1954).]

Cross-circulation experiments on dogs showed that intravenously injected chlorpromazine slightly attenuated but did not suspend the activity of the adrenaline-secretory centers.

L. E. GILSON (Chem. Abstr.)

Determination of Chlorpromazine in Different Tissues. Gouzou, B., et al. [Compt. rend. soc. biol., **148**, 2039 (1954).]

Determinations of chlorpromazine in tissues were made by the method of Dubost and Pascal (Ann. pharm. Franc., **11**, 615 (1953)). After intravenous injection of various doses in dogs chlorpromazine rapidly disappears from the blood. There is elective fixation in the central nervous system. The highest concentration is in the brain cortex with very little in the medulla and small amounts in the cerebellum. Much is found in the kidneys and small amounts in the liver and muscles.

L. E. GILSON (Chem. Abstr.)

Oxygen Consumption, Blood Supply, and Vulnerability of the Brain of Warm-blooded Animals Under the Influence of Chlorpromazine. Frowein, R. A., et al. [Naunyn-Schmiedeberg's Arch. exptl. Pathol. Pharmacol., **226**, 62 (1955).]

Measurements of oxygen consumption and blood flow in the brain of dogs in chloralose anesthesia showed no changes after the administration of 2-10 mg. chlorpromazine/kg. If the blood pressure dropped below a critical level, a nonspecific reduction became manifest. The ability of recovery of the brain after acute total ischemia was influenced by variation in temperature and blood pressure in the same way in the controls as in the chlorpromazine-treated animals. The production of a hypo-oxidation by a toxic effect of chlorpromazine to the tissues in warm-blooded animals does not seem to occur.

A. E. MEYER (Chem. Abstr.)

Analogy of Action of Substances With a Different Point of Attack on the Neurovegetative System. Bein, J. H. [Ibid., 422-8.]

A discussion of the different pharmacological actions of sympathicolytic substances (ergot alkaloids, dioxane compounds), parasympathocolytics (atropine, banthine, Anthrenil, regitine), of ganglioplegics proper (hexamethonium compounds), and of the less specific group comprising Apresoline, Rauwolfia alkaloids, and chlorpromazine. The testing methods are briefly discussed.

A. E. MEYER (Chem. Abstr.)

Effect of Chlorpromazine on the (Human) Electroencephalogram and Electrodermogram. Turner, M., and Bérard, E. [Rev. soc. argentina biol., **30**, 163 (1954).]

Tracings and discussion. The results are interpreted as indicating a lytic effect in structures of the mesodiencephalic level which control the states of consciousness, the cortical electrical activity, and the central sympathetic discharges.

L. E. GILSON (Chem. Abstr.)

Action of Some Phenothiazine Derivatives on the Central Nervous System. Balestrieri, A., and Fadiga, E. [*Arch. sci. biol.*, **38**, 620 (1954).]

The effect of largactil and antipar was studied in the cat by electroencephalic registration of responses to direct stimulation of the reticular substance and of the sciatic nerve, and to auditory stimulations. Largactil increases the threshold of response, antipar has no such evident effect. The higher threshold is more easily observed by stimulation of the reticular substance than the sciatic nerve. Neither drug has an influence on the response to acoustic cortical stimulation.

A. E. MEYER (Chem. Abstr.)

Action of Chlorpromazine on the Central Nervous System. Dasgupta, S. R., et al. [*Bull. Calcutta School Trop. Med.*, **1**, No. 3, 14 (1954).]

The action of 2-chloro-10-(3-dimethylaminopropyl)phenothiazine (chlorpromazine, largactil) is markedly increased in animals after the removal of the cerebral cortex. In the normal animal 1.0–3.0 mg./kg. Bilateral superficial incisions on the bases of the frontal lobes just in front of the optical chiasm cause no enhancement in drug sensitivity. This is obtained only after additional 5 mm. deep incisions are applied to the dorsolateral surface of the frontal lobes.

DORIT L. NOETHER (Chem. Abstr.)

Effects of Reserpine on the Electro-encephalic and Motor Reactions Elicited by Hypothalamic Stimulation. Longo, V. G., and Napolitano, L. [*Il Farmaco (Pavia) Ed. sci.*, **10**, 297 (1955).]

The 1st phase after administration of reserpine to rabbits consists in excitation as evidenced in the electro-encephalogram by decrease of the periods of rest, prolonged activity periods, and occasionally by the appearance of spike bursts. The following phase is characterized by a block of the stimulation usually elicited by sensory perceptions. The motor and emotional reactions produced by electrical stimulation of hypothalamic centers through permanently implanted electrodes are attenuated or abolished by the drug. Reserpine influences equally the emotional responses and the electro-encephalographic reaction to hypothalamic stimuli. The drug depresses the reactions of the ascending and descending parts of the reticular system. The only reaction that is not influenced even by large doses of the alkaloid is the pressor effect. While barbiturates in hypnotic doses also inhibit the emotional responses to hypothalamic stimulation, reserpine produces this block with doses having only a slight sedative effect. Conclusion: reserpine has a point of attack in the diencephalic nuclei.

A. E. MEYER (Chem. Abstr.)

Further Characterization of Central Effects of Reserpine (Serpasil). Schneider, Jurg A., et al. [*Am. J. Physiol.*, **181**, 64 (1955).]

Reserpine (serpasil) counteracts the manifestation of sham rage in cats. The blood pressure rise after direct electrical stimulation of the diencephalon in anesthetized cats was not decreased after reserpine, whereas the carotid occlusion reflex was lessened. The experiments support the theory that reserpine causes a central block or inhibition of afferent impulses which normally stimulate the sympathetic activity rather than a direct depression of diencephalic sympathetic centers.

E. D. WALTER (Chem. Abstr.)

Significance of Selected Central Mechanisms for the Analysis of the Action of Reserpine. Bein, H. J. [*Ann. N.Y. Acad. Sci.*, **61**, 4 (1955).]

Pressor carotid sinus reflexes and accompanying reflex respiratory changes were diminished by 10–20 γ /kg. doses of reserpine given intravenously to anesthetized cats. Various experiments showed that reserpine did not influence respiration by acting on the vagal respiratory reflexes, the medullary inspiratory and expiratory substrates, or the motor pathway and neuromuscular transmission, respectively. Hyperventilation apnea was markedly shortened or eliminated by intravenous 70 γ /kg. doses of reserpine in rabbits, but this effect was found in only 1 of 8 cats similarly treated. Thirty-seven references.

F. N. LEBARON (Chem. Abstr.)

Neuropharmacological Aspects of Reserpine. Schneider, Jurg A., et al. [*Ann. N.Y. Acad. Sci.*, **61**, 17 (1955).]

The effect of 5 mg./kg. doses of reserpine on synaptic transmission in the spinal cord was investigated. Reserpine caused a facilitation of the knee jerk in spinal cats and an increase in the height of the monosynaptic spike measured in the ventral root of the spinal cord of a decerebrate cat when the dorsal root was stimulated electrically. Similar measurements of polysynaptic spikes gave equivocal results. The authors suggest that reserpine acts by increasing cortical inhibition on diencephalic structures. Forty-four references.

F. N. LEBARON (Chem. Abstr.)

A Comparison of Effects of Reserpine and Some Barbiturates on the Electrical Activity of Cortical and Subcortical Structures of the Brain of Rabbits. Rinaldi, Franco and Himwich, Harold E. [Ann. N.Y. Acad. Sci., **61**, 27 (1955).]

Reserpine administered intravenously to unanesthetized, curarized rabbits in doses up to 0.5 mg./kg. caused no change in the electrical activity of the brain. With doses of 1.5–2.0 mg./kg. a continuous electrographic alertness pattern was obtained which was indistinguishable from the spontaneous alertness pattern. Intermediate doses increased the incidence of spontaneous alertness patterns. Barbiturates caused a pattern which was similar to, but not identical with the normal sleep pattern. The authors concluded that reserpine stimulated and barbiturates depressed the mesodiencephalic activating system.

F. N. LeBARON (Chem. Abstr.)

Effects of Parenteral Reserpine on Cerebral Blood Flow, Oxygen, and Glucose Metabolism, and Electroencephalograms of Patients with Essential Hypertension. Hafkenschiel, J. H., et al. [Ann. N.Y. Acad. Sci., **61**, 78 (1955).]

Doses of 40–108 γ /kg. of reserpine reduced the arterial blood pressure of 5 patients with essential hypertension by 20 per cent. but caused no significant changes in cerebral blood flow, glucose uptake, O uptake, venous O tension, or electroencephalograms.

F. N. LeBARON (Chem. Abstr.)

Ethanol Metabolism and the Action of Antabuse. (II). Fujiwara, Eiichi. [Folia Pharmacol. Japon., **50**, 402 (1954).]

Rabbits were injected intraperitoneally with 100 cc. 3 per cent. EtOH per kg. daily. This caused marked decrease of body weight and strong intoxication which lessened with acquirement of habituation. A single injection increased the respiration rate with a maximum after 30 minutes and returning to normal after 2 hours. It decreased the body temperature considerably and sometimes recovery was very slow. Habituation to EtOH was obtained by continuing the above injection for 1 and 2 weeks. The EtOH in the blood was: non-habituated 1.31; non-habituated with administration of antabuse, orally 0.5 g./kg., 1.39; habituated for 1 week 2.39; habituated for 2 weeks 5.32; and habituated for 2 weeks with administration of antabuse 5.86 mg. per cent. Injection of EtOH into these groups caused an increase of EtOH maximum after 2 hours in non-habituated and 1 week habituated rabbits and after 30 minutes in 2 week habituated ones. Returning to the normal state was faster in the habituated animals. Those previously administered antabuse retained EtOH longer with a slow return to normal level; in this case the habituated animals recovered faster. In habituated rabbits the AcH contents in the blood were large for a longer period after injection of EtOH. When antabuse was given, this delay of AcH metabolism was more marked. Influence of EtOH habituation on brain waves was examined. EtOH injection induced disappearance of the fast wave and the appearance of a prominent slow wave in the brain waves of non-habituated rabbits, indicating the inhibitory effect of EtOH. The fast wave was apt to increase on EtOH injection as habituation proceeded. Previous administration of antabuse hardly affected the brain waves. In habituated animals, administration of antabuse followed by injection of EtOH resulted in the appearance of the fast wave in succession with intermittent spikes or convulsive waves. Spleen was markedly deformed by habituation and antabuse treatment; brain, eye, lung, liver and kidney were not affected.

SHOZABURO KITAOKA (Chem. Abstr.)

Pyridoxine Hydrochloride in Acute Alcoholic Intoxication. Small, M. D., et al. [J. Lab. Clin. Med., **46**, 12 (1955).]

The effect of 0.5 to 2.0 g. of pyridoxine hydrochloride on acutely alcoholic subjects was evaluated by using objective tests of mental and neurological coordination. Apparently, there is no prompt or consistent effect of intravenous pyridoxine on alcoholic intoxication.

FRANK IBER (Chem. Abstr.)

The Influence of Antabuse and Alkazol on the Blood Alcohol Level. Portheine, Friedrich. [Zentr. Arbeitsmed. Arbeitschutz, **1**, 84 (1951); Chem. Zentr., 1951, **11**, 3205.]

The aversion preparations, Antabuse and Abstiny, which have as their base tetraethylthiuram disulfide, do not affect the blood alcohol curve when used for the treatment of chronic alcoholism. Inhaling the fumes of the motor fuel, Alkazol (gasoline 50, alc. 36, and benzene 14 per cent.), does produce symptoms of intoxication. Results reported indicate that these symptoms must be due to acute benzene poisoning, since the course of the blood alcohol curve is not affected.

M. G. MOORE (Chem. Abstr.)

New Chemotherapeutics for Alcoholism. Delay, J., et al. [Ann. médico-psychol., **2**, 427 (1949).]

Pharmacological effects of various drugs are described. In the amphetamine group, d-methyl-amphetamine-HCl (30 mg. intravenously) is effective in producing therapeutic shock in acute alcoholism. Daily doses of 5–10 mg. orally disintoxicate chronic alcoholics, with little danger of producing a new addiction.

W. C. TOBIE (Chem. Abstr.)

Role of the Nervous System in the Hypothermic Action of Pentamethylenetetrazole. Obal, F., et al. [*Acta Physiol. Acad. Sci. Hung.*, **7**, 211-21 (1955).]

Pentamethylenetetrazole (I) caused hypothermia in rats and guinea pigs. Low doses of (I) caused a greater hyperthermia in the guinea pig. The conditioned reflex which was developed with hypothermic doses of (I) was a rise in temperature.

S. ELLIS (Chem. Abstr.)

Blood Cholesterol in Electroshock. Lippi, M., and Argiolas, N. [*Rass. med. sarda*, **50**, 409 (1948).]

In 20 psychotic patients given electro-shock, blood cholesterol increased in 45 per cent. after the seizure, decreased in 40 per cent., and did not change in 15 per cent. In 12 cases, an immediate change in level was followed by a reversal after 90 minutes. Each individual reacts in a different way (especially in cholesterol metabolism (I)) to a given stimulus. (I) is regulated by the reticulo-endothelial system and the endocrine glands (especially the gonads) which are variable in action.

W. C. TOBIE (Chem. Abstr.)

Effect of Electric Shock on Some Experimental Blood-sugar Curves. Isaja, M. [*Schizofrenie*, 1949, 83-96; *Excerpta Med.*, Sect. VIII, **3**, 483 (1950).]

In 10 schizophrenics, electric-shock therapy was used in combination with insulin (I), adrenaline (II), and glucose tolerance test (III). In combined (I) treatment, the hyperglycemic peak of shock was counteracted by the insulin to give prolonged hypoglycemia. With (II), the adrenaline synergized the shock to give intense and prolonged hyperglycemia. With (III), there was a summation of the 2 hyperglycemic effects. Since some workers think that electric shock acts by producing hyperglycemia, further trials of combined (II) treatment should be made.

W. C. TOBIE (Chem. Abstr.)

Correlations Between Drug Action and Specific Cholinesterase (ChE) Activity of Brain Tissue. Tagaki, H. [*Folia Pharmacol. Japon.*, **48**, 300 (1953).]

Mice were treated with convulsant or anticonvulsant drugs and after toxic signs or death had resulted the specific ChE activities of their brains were determined by the method of Hall and Lucas. The results did not indicate a close correlation between the action of these drugs and ChE activity.

R. D. H. (Chem. Abstr.)

The Content of Acid-soluble Pentoses in the Entire Brain of Guinea Pigs Treated with Electric Shock. Fazio, C., et al. [*Boll. soc. ital. biol. sper.*, **30**, 795 (1954).]

In guinea pigs treated with electric shock the value of the acid-solution pentoses of the entire brain was moderately increased above that of the controls. The increase was observed both in brains from animals killed in the convulsive phase immediately after the shock and in those killed 24 hours after the shock. The increase was not observed in those killed 50 hours after the shock. There was no difference between animals which received a single shock and those which received repeated shocks every other day.

FELIX SAUNDERS (Chem. Abstr.)

Histaminase Activity of Serum in Individuals Subjected to Electroshock. Prassoli, Armando. [*Minerva ginecol.*, **6**, 753 (1954).]

A considerable drop of the histaminase activity (I) of serum occurred 15 minutes after electroshock in women with mental diseases and in full sexual activity. (I) began to increase after 60 minutes.

C. SCANDURA (Chem. Abstr.)

*Influence of Metrazole, Strychnine, and Curare on the Electrical Activity of the Brain and Cord of the Salamander (*Triturus viridescens*).* Peters, J. J., et al. [*J. Pharmacol. Exptl. Therap.*, **114**, 225 (1955).]

Electroencephalograph tracings and discussion.

L. E. GILSON (Chem. Abstr.)

Treatment of Migraine. Santiso, R. Pascual. [*Rev. clín. españ.*, **57**, 116 (1955).]

A review including drug and hormone therapy.

L. E. GILSON (Chem. Abstr.)

Role of the Nervous System in the Hypothermic Action of Procaine. Kelemen, A., et al. [*Acta Physiol. Acad. Sci. Hung.*, **7**, 229 (1955).]

In guinea pigs and rats procaine caused hypothermia. The conditioned reflex was hypothermia. With small daily doses the conditioning led to a reduced hypothermia or even hyperthermia in response to procaine.

S. ELLIS (Chem. Abstr.)

Role of the Nervous System in the Action of Sympatholytic Natural and Reduced Ergot Alkaloids. Fall, S., et al. [*Acta Physiol. Acad. Sci. Hung.*, 7, 223 (1955).]

A conditioned reflex involving hyperthermia was developed with hypothermic doses of ergotamine or dihydroergotamine.

S. ELLIS (Chem. Abstr.)

Changes in Spinal Reflexes in Man after Oral Administration of a Moderate Dose of Caffeine. Gualtierotti, Torquato and Margaria, Rodolfo. [*Atti accad. nazl. Lincei Rend., Classe sci. fis., mat. e nat.*, 18, 16 (1955).]

Administration of 0.25 g. caffeine to normal men, showing uniform neurological reactions produced within 1 hour the following effect: muscular potentials increased suddenly in amplitude to twice the original values. The effect lasted to the 5th hour then returned to normal within 30 minutes. The reflex time decreased by about 10 per cent. of its normal value. The duration of the electric manifestation was not changed. The muscular conduction time was unchanged.

A. E. MEYER (Chem. Abstr.)

Sodium Succinate, an Analeptic for Barbiturate Poisoning in Man. Barrett, R. H. [*Ann. Internal Med.*, 31, 739 (1949); *Excerpta Med. Sect. VIII*, 3, 557 (1950).]

The mechanism of analeptic action is probably closely connected with tissue respiration and the role of succinic oxidase (and presumably that of cytochrome oxidase). There may also be an additional reflex mechanism connected with the hypertonic effect. Pharmacological results in 14 cases of probable barbiturate poisoning are described.

W. C. TOBIE (Chem. Abstr.)

Notes on the Use of Pentothal as an Electroencephalograph Activator. Plisson, M., and Rémond, A. [*Rev. neurol.*, 81, 509 (1949); *Excerpta Med., Sect. VIII*, 3, 580 (1950).]

Data are given on the action of the drug on electric brain waves in normal subjects, epileptics, and cases of cerebral tumor and focal cerebral lesions. The more rapidly an adequate dose is injected, the more satisfactory the reactions.

W. C. TOBIE (Chem. Abstr.)

Gravitol and the Autonomic Nervous System. Wyss, R. [*Praxis (Bern)*, 39, 33 (1950); *Excerpta Med. Sect. VIII*, 3, 508 (1950).]

Gravitol has anticholine activity and shows partial action on the adrenaline and histamine effects.

W. C. TOBIE (Chem. Abstr.)

Action of Succinic Acid in Barbiturate Intoxication. Kohler, Denyse and Barbe, Monique. [*Compt. rend. soc. biol.*, 149, 43 (1955).]

Although Na succinate is an antagonist of the action of barbiturates on the nervous system, its injection in rabbits prior to injection of somnifen augments rather than prevents the production of pulmonary edema by the somnifen.

L. E. GILSON (Chem. Abstr.)

Pharmacodynamics of Ganglioplegic Substances. Symposium on Ganglioplegics. Zaimis, J. [*Atti soc. lombarda sci. med. biol.*, 9, 417 (1954).]

A general discussion on classification of ganglioplegic compounds with special emphasis on the action of hexamethonium, pendiomide, and Pentapyrrolidinium.

A. E. MEYER (Chem. Abstr.)

Application of Hexamethonium in the Treatment of Hypertension in Man. Rosenheim, M. L. [*Ibid.*, 429-32.]

A general discussion. The drug is not satisfactory as a treatment.

A. E. MEYER (Chem. Abstr.)

Clinical Results of Treatment of Essential Hypertension with Ganglioplegic Drugs; the Inconvenience of the Treatment. Bartorelli, C. [*Ibid.*, 433-51.]

Discussion mainly of hexamethonium. Extensive bibliography.

A. E. MEYER (Chem. Abstr.)

Ganglion Paralysis in Anesthesia. Hale Enderby, G. E. [*Ibid.*, 452-6.]

Description of the use of pentolinium to obtain a uniform low blood pressure during anesthesia. The purpose, advantages, and dangers are explained.

A. E. MEYER (Chem. Abstr.)

Application of Ganglioplegic Drugs in General Surgery. Oselladore, G., and Damia, G. [*Ibid.*, 457-5.]

The hemostatics of blood circulation in surgery and the influence of ganglioplegic agents are discussed.

A. E. MEYER (Chem. Abstr.)

Ganglioplegic Drugs in Neurosurgery. Bozza, M. [*Ibid.*, 466-74.]

Discussion of the rationale of blood pressure lowering drugs and experience with thiazine compounds. One hundred and twenty-four references.

A. E. MEYER (Chem. Abstr.)

Ganglioplegic Compounds in Shock, Visceral Pain, and Peripheral Arterial Disease. Donati, G. S. [*Ibid.*, 475-90.]

Clinical. Seventy-eight references. Discussions: *ibid.*, 490-501.

A. E. MEYER (Chem. Abstr.)

Variations in the Frog's Spinal Reflexes Caused by the Action on the Brain of Large Doses of Caffeine. Gualtierotti, T. [*J. Physiol. (London)*, **128**, 320 (1955).]

Three minutes after intraperitoneal injection of caffeine (I) (20-30 mg./kg.) a notable increase occurred in the number and amplitude of the reflex responses in curarized intact or mesencephalic or diencephalic frogs, with no tendency towards an increased synchronization. Ten minutes after injection a negative shift occurred and action potentials began to synchronize (Strychnine-like) in groups; 15 minutes after injection this negative shift and synchronization had reached a peak value and synaptic potentials were also increased in amplitude. These persisted unchanged for 2-3 hours and reverted to normal by 4 hours after injection. Twice these doses of (I) produced spontaneous motor potential discharges. Local application of 0.5 per cent. solution of (I) to the brain produced only an increase in amplitude of the normal reflex response and a negative shift of the potential level. The latter responses are, therefore, considered to be the result of brain action only, whereas synchronization of rapid activity increase in amplitude of synaptic potentials must involve a spinal component.

MORRIS ROCKSTEIN (Chem. Abstr.)

Contribution of Spinal Centers to the Action of Caffeine on Frog's Spinal Reflexes. Gualtierotti, T. [*J. Physiol.*, **128**, 326 (1955).]

Intraperitoneal injection of caffeine (I) caused synchronization but not elevation of action potentials (II) of the nerve cord of the spinal curarized frog at 3 minutes, to a maximum at 18 minutes after addition of (I). This effect persisted for 40 minutes. If the animal was made spinal (15 minutes) after (I) injection, the synaptic motor (II) became larger than normal for 3-5 minutes before the cut and fell to normal after decerebration. Such augmentation of (II) is directly related to the anticholinesterase activity of (I). Addition of (I) to Ringer solution bathing the exposed nerve cord preparation, but not local application of filter paper bits soaked in (I), produced results similar to injection of (I). Because sensory synaptic (II) of spinal frogs became elevated by (I), it is suggested that the effects of (I) are direct for sensory, but require a brain component for motor synaptic (II).

MORRIS ROCKSTEIN (Chem. Abstr.)

Overcoming Conditions of Exhaustion by the Use of Sex Hormones. Duker, Heinrich. [*Psychiat., Neurol. Med. Psychol.*, **3**, 104 (1951).]

States of exhaustion (even high-grade) could be overcome by treatment with sex hormones. The effect was permanent rather than temporary. Preparations used were Testoviron (1-4 mg. daily) and Progynon (0.1-0.35 mg. daily). Both sex hormones of the same sex as the patient and those of opposite sex were used.

M. G. MOORE (Chem. Abstr.)

The Effect of Compound 48/80 on Ganglionic Transmission. Gertner, S. B. [*Brit. J. Pharmacol.*, **10**, 103 (1955).]

Both compound 48/80 and propamidine caused ganglionic block in the perfused superior cervical ganglion of the cat. Compound 48/80 did not decrease the amount of acetylcholine (I) released from the preganglionic endings but rendered the ganglion less sensitive to released (I). Compound 48/80 released histamine from the perfused ganglion but this could not be related to the blocking action.

R. F. RILEY (Chem. Abstr.)

Effectiveness of β -pyridyl Carbinol on Cerebral Vessels. Gross, H., and Hackl, H. [*Wein. klin. Wochschr.*, **67**, 10 (1955).]

In animal experiments and histologic tissue preparation a dilating effect on intracerebral vessels was perceived.

AMELIE L. GRAUER (Chem. Abstr.)

Effect on the Central Nervous System of Intravenously Injected Procaine. I. The Depression of Cerebrospinal Reflexes by Procaine. Kaverina, N. V., and Khayutin, V. M. [*Bykull. Eksptl. Biol. i Med.*, **38**, No. 10, 49 (1954).]

Cats were narcotized by administration of urethan. The central end of the tibial nerve was stimulated by induction current, and the height of the response of the bending reflex of the hind leg was estimated from the degree of contraction of the anterior tibial muscle. Other reflex-evoking methods were also employed. The injection of 20-30 mg./kg. of procaine (I)

completely depressed the reflex contractions of the anterior tibial muscle. (I) 5-7 mg./kg. injected via the jugular vein generally lessened the contraction amplitude of the muscle before and after severing the spinal cord, indicating that (I) affects some undetermined elements of the cerebrospinal reflex arc. After injection of (I) in some instances the contraction of the anterior tibial muscle disappeared first, followed by that of the semitendinosus muscle; in other instances this succession was reversed. The indications are that the depression of muscular contractions under the experimental conditions is not related to the effect of (I) on the afferent fibers of the peripheral nerve trunk; thus, it appears that (I) acts either on the central or on the motor part of the reflex arc. Injection of 5.5 mg./kg. of (I) caused a barely observed depression of the reflex contractions of the anterior tibial muscle, but slightly enhanced the amplitude of the knee reflex. This is not related to the direct effect of (I) on the elements of the knee reflex arc, but rather it is an expression of the acute spasmodic contractions of the flexor muscles of the leg. The motor part of the knee and cross reflex arc is common to both, yet (I) in doses of 4-7 mg./kg. completely depressed only the cross reflex, affecting the knee reflex only slightly. It would seem, therefore, that the motor neurons could not constitute the basic site of the action of (I). A method is presented for the calculation of (I) concentration which causes depression of reflex contraction of the anterior tibial muscle.

B. S. LEVINE (Chem. Abstr.)

The Effect of Glutamic Acid Upon Phosphorus Compounds of Brains. Ivanov, V. I., and Rozenberg, P. A. [Byull. Eksptl. Biol. i Med., 39, No. 2, 33 (1955).]

Glutamic acid has a stimulating effect upon adenosinetriphosphate (ATP) the first few hours after its administration. The effect is decreased at the end of 24 hours. Repeated administrations of glutamic acid increased again the amount of (ATP) during the first 3 days but declined beyond this period, remaining however higher than that of control animals.

A. S. MIRKIN (Chem. Abstr.)

Influence of Several Kinds of Anesthetic Upon the Brain Wave of Cats. Muramatsu, Masami [Folia Pharmacol. Japon., 50, 443 (1954).]

The brain waves were conducted from both gyrus sigmoides posterior and gyrus lateralis of cat brain. The α -wave was defined to be 7-13 per second, and the β -wave to be faster than that, a slow wave means one slower than the α -wave. In normal cat brain, both α - and β -waves overlapped. Anesthetizing with ether made the β -wave more distinct with disappearance of the α -wave and marked decrease of the brain wave amplitude suggesting its brain wave-suppressing action. No difference was found between the shapes of the waves from both conduction sites. With awakening of cat, the brain waves recovered the normal shape in 60 minutes. CHCl_3 and morphine hydrochloride showed a similar effect. CHCl_3 produced in addition a slow wave with large amplitude. Phenobarbital caused slowing of the brain wave and increased the wave amplitude. Seconal-Na and amytal-Na also slowed the brain wave and increased the amplitude immediately after their injection; the α -wave also disappeared immediately. MgSO_4 made the β -wave markedly distinct and the wave amplitude smaller. By anesthetizing with paraldehyde the amplitude of the brain wave became smaller and the α -wave disappeared, resulting in a flat wave shape. When Luminal-Na was injected intravenously, the α -wave immediately became distinct and the amplitude increased, but with time the α -wave gradually decreased with gradual overlapping with the slow wave. The α -wave, however, never disappeared completely in the deepest anesthesia. The difference of the effects of these anesthetics upon the cat brain wave was suggested to be due to the difference of their site of action.

SHOZABURO KITAOKA (Chem. Abstr.)

Effects of Drugs on the Electroencephalogram (EEG). Isenschmid, R. [Therap. Umschau., 9, 77 (1952).]

A review of EEG modifications produced by various drugs acting on the central nervous system, especially those with hypnotic and stimulating effects.

A. M. M. (Chem. Abstr.)

Two Pictures of the Nervous System (Hydrocephalus Internus and Radiculitis) After Exposure to Carbon Monoxide, in Addition to an Explanation of Poisoning by Carbon Monoxide. Schilf, E. [Psychiat., Neurol. Med. Psychol., 3, 193 (1951).]

Two cases of CO poisoning are reported: one, a case of hydrocephalus internus developed by a worker removing slag and the other a case of radiculitis of the arm resulting from attempted suicide by illuminating gas. In both, the CO is regarded as the triggering agent rather than the true cause of the symptoms. The effective factor in CO poisoning, which appears after the fixing of the CO by the hemoglobin, is the secondarily developed anoxemia with subsequent disturbance of the permeability of the capillaries, exudation into the surrounding tissue in the sense of a serous inflammation and damage (O_2 and nutritional deficiency) of the parenchyma. All of the experimental findings offered in support of a specific CO poisoning are based upon work in which the CO is introduced into the site of action by nonphysiological means or the differences occasionally observed between anoxemia induced by CO and other anoxemias are over emphasized. The anoxemia produced by CO naturally varies

with the degree of exposure to the gas. An argument against the possibility of a true CO poisoning is the fact that animals with CO-saturated blood can be kept alive under an excess O pressure.

M. G. MOORE (Chem. Abstr.)

Effects of Diplatsin on Nerve Transmission in Various Parts of the Reflex Path. Val'dman, A. V., et al. [*Farmakol. i Toksikol.*, **18**, No. 2 (1955).]

Diplatsin (e.g. at 4-5 mg./kg. in cats) lessens the lability of neuromuscular synapses. At 2-5 mg./kg. it shows no histamine-sensitizing effect. It impedes nerve impulse transmission to the cardiovascular system, and causes bronchospasmodic effects which are intensified by proserine. But even at 50-100 mg./kg. diplatsin does not significantly alter the character or amplitude of spinal cord reflexes.

JULIAN F. SMITH (Chem. Abstr.)